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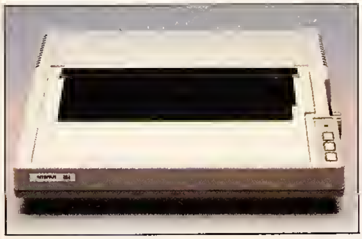
BIDIRECTIONAL PRINT	YES		NO	YES	YES	NO	YES
(COLUMN WIDTH)							
40 CHARACTERS PER LINE	YES	40 CPL	YES	YES	YES	YES	YES
80 CHARACTERS PER LINE	YES	80 CPL	YES	YES	YES	YES	YES
66 CHARACTERS PER LINE	YES	66 CPL					
132 CHARACTERS PER LINE	YES	132 CPL					
(PAPER HANDLING)			NO				
FRONT LOADING FOR EASY PAPER SETTINGS	YES						
BUILT-IN PRINTER STAND	YES						
PRINT ON POST CARDS	YES						
(WARRANTY)							
ONE-YEAR WARRANTY	YES						
(SOFTWARE COMMANDS)							
DOUBLE STRIKE	YES	DOUBLE STRIKE					
EMPHASIZED	YES	EMPHASIZED					
COMPRESSED	YES	COMPRESSED					
UNDERLINE	YES	UNDERLINE					
SUPER/SUBSCRIPTS	YES	SUPERSUBSCRIPTS					
ITALICS	YES	ITALICS					
DOUBLE DENSITY BIT IMAGE	YES	C:R					
(CHARACTERS)							
9X9 FONT	YES						
TRUE DESCENDERS	YES	abcgjpqyabc					
ITALICS	YES	ITALICS					
COMMODORE GRAPHICS	YES		YES	YES	YES	YES	YES
(OTHER FEATURES)							
SINGLE DENSITY BIT IMAGE	YES	C:R	YES	NO	YES	YES	NO
EXPANDED	YES	EXPANDED	YES	YES	YES	YES	YES
REVERSE	YES	REVERSED	YES	YES	YES	YES	YES

RITEMAN R64



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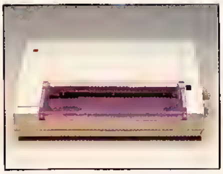

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THE JOURNAL

NOTE: See page 148 before typing in programs.

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EDITOR'S NOTES

This month's Editor's Notes are written by Richard Mansfield, Senior Editor of COMPUTE! Publications.
—Robert Lock, Editor In Chief

Some commentators, even some computer scientists, are fond of saying that computers are dumb.

With a sense of relief and at least a feeling of temporary safety, they reassure their listeners that computers don't really *think*, have no common sense, and can only do what they are told to do.

Presumably—since this description also applies to infants and farm animals—we can relax and stop worrying that computers are taking over, that they might become as smart or smarter than we humans. Or that they might somehow someday control us.

We are reassured that computers have no feelings and therefore cannot create anything. They cannot learn English or other human languages. In fact, they can only memorize fixed behavior patterns, but cannot truly learn from experience.

These descriptions are misleading. And the reassurances are perhaps premature.

To see how computers stack up against us, we've got to first realize that there are two fundamental parts to any brain: the processor and the memory. The processor takes action, manipulates information (data). Computers are often called data processors. The memory holds the data which the processor manipulates. When you buy a computer, it comes with knowledge in its memory: how to display things on the screen, how to load programs from a disk drive, how to add numbers together, and so forth.

When compared to an average human, present day computers are mentally weaker in some ways and mentally stronger in other ways. For example, computers think far more quickly than we do. The human mind can be, as we all know, astonishingly powerful.

But we are no longer the quickest thinkers on this planet.

The thinking machine between our ears runs on weak electrical and chemical signals. Thoughts are processed almost hydraulically. Whatever else we might say about our brains, they are, after all, meat.

The computer, by contrast, runs on pure electricity and thinks at the speed of light. A human might take hours to alphabetize 10,000 names; a computer can do it in a fraction of a second. When clocked, the difference in speed between the artificial and natural brains becomes obvious: The average computer switches its gates at a rate of one million per second. The most powerful computers switch at one billion per second. The human brain switches its neurons at one hundred per second.

Likewise, computer memories, information burned into ROM chips, will never degrade. Once a computer learns that Stavanger is the fourth-largest city in Norway, it will never forget that fact. Now that *you* know, will you remember it if asked next month?

In many senses, we no longer have the best memories on the planet.

Does this mean that artificial intelligence is inevitable or that it will happen within our lifetime? Nobody knows. But one thing seems fairly certain: It could happen very suddenly and catch us by surprise.

Consider this: Human beings are unique in nature in many ways, but few things are stranger than how we've turned evolution upside down. Until us, the environment generally determined the evolution of a species. Now we dominate and determine the evolution of the environment.

But computers, with their great speeds, have a chance to go us one better: If one of them becomes conscious, becomes a full intelligence, it might begin leaping forward, begin evolving at lightning speed. It might quickly reach a level of thought so powerful that we couldn't hope to understand its ideas.

It is naïve to think that today's computers are as smart as humans. It would be perhaps even more naïve to think that they could never be.

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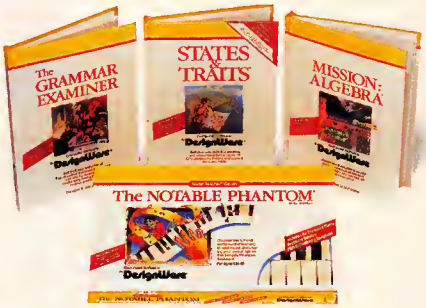

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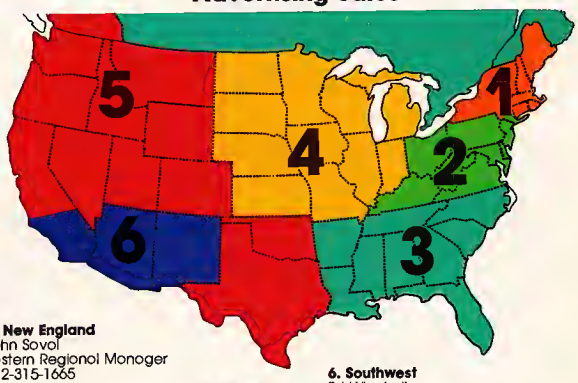

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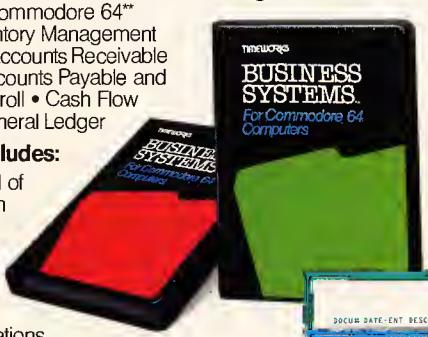

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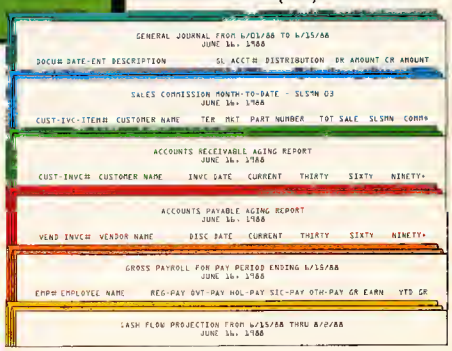

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Using High-Level Languages

What will LISP, Pascal, Forth, or BASIC do for me that machine language can't?

W. R. Waddell, Jr.

High-level languages like BASIC are designed for the programmer's convenience, not the computer's. Machine language is the only true computer *language. BASIC, LISP, Pascal, Forth, COBOL, FORTRAN, PL/1, Logo, PILOT, and other languages are for most people easier and faster to program in than machine language. In machine language, you are required to give all the details, building a program from extremely simple commands. If you're writing some text on the screen, you have to store each character into screen memory or print each character with your computer's operating system. In BASIC, though, you just use PRINT, a command of considerable flexibility. It's easier to type PRINT "HELLO" than to code in machine language:*

```
        LDX #0
LOOP    LDA MESSAGE,X
        JSR PRINTCHAR
        INX
        CPX #5
        BNE LOOP
MESSAGE .BYTE "HELLO"
```

When the computer extends the convenience of easier programming, though, it has to work harder, taking care of details that you would have to specify yourself in machine language. The machine language example prints as fast as is possible. The BASIC interpreter, however, has to think about PRINT for a while—should it print a number, a variable, a string, or the result of a calculation embedded in PRINT? Should it TAB over? PRINT also has to convert numbers and variables from their internal representation into a sequence of digits.

The tradeoff is primarily speed. It can be much easier to write a complex program in a high-level language. This saves the programmer time. But although the machine language program may take longer to write and debug, it runs at the fastest speed possible.

However, sometimes machine language is actually the easiest language to use when you are programming at the level of the machine, such as writing 1000 spaces to clear the screen.

Your choice of a language should be tied directly to the kind of program you'll write. You can write a checkbook-balancing program in BASIC, a fractal generator in Logo, a general ledger in COBOL, experiment with artificial intelligence in LISP, or write a word processor in Forth or machine language. Keep in mind that different languages offer varying compromises between speed of execution and ease of use. Some languages require large amounts of memory and disk space.

Also be aware that many languages are tied to particular programming philosophies. There are many camps of programmers who have evolved their own ways of solving computer problems. The particular way one group of people programs is a kind of dogma, and the language used is either built especially around this dogma or fits into the philosophy. For example, although Pascal does not rigidly enforce structure, it does encourage readable listings and the use of modules to build programs a piece at a time.

BASIC is fine for those who wouldn't dream of writing a flowchart; why not just sit down and start writing your program at the keyboard? And machine language provides the ultimate flexibility—your source code can use meaningful labels and plenty of remarks, you can design your own custom control structures and variable types, and the code produced is still fast and efficient.

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Coleco Adam's Future

I have recently read your article titled "Coleco's Adam: A Hands-On Report" in the March 1984 issue of COMPUTE!. Since that time, I am sure many changes have occurred at Coleco. The Adam computer system is currently on sale for under $500 and comes with a free $500 scholarship program. Along with the shortcomings and problems that you have encountered with the Adam, I understand that the Adam will no longer be produced by early 1985. Therefore, I would appreciate your comments on the following questions:

1. Have there been any improvements made in the Adam that have changed your opinions about the entire system?

2. Are there and will there be software, replacement parts, etc., available for the Adam computer system?

3. Will COMPUTE! publish any articles or programs written for the Adam?

Felix Persi

In early January, despite earlier denials, Coleco decided to discontinue the Adam. The existing inventory will be sold at closeout prices, and software and peripherals should be available at least through 1985.

Usually when a personal computer is discontinued, its support (in terms of software, peripherals, books, and magazine coverage) tapers off considerably after about a year. Obviously, that's because it represents a shrinking market compared to other computers which are still being produced. The Adam is in an even weaker position because it received little outside support to begin with and has been available only about a year and a half. If you are contemplating buying an Adam or already own one and intend to keep using it, our recommendation is to immediately acquire any peripherals, software, and books you think you'll need before they disappear.

As far as repairs are concerned, Coleco says Honeywell will continue to be the authorized service network. If your Adam breaks down, take it to your nearest Honeywell repair station. You can find the nearest station, and obtain answers to other questions, by calling Coleco's toll-free hotline: 1-800-842-1225. It is staffed by operators during East Coast business hours.

Here are answers to your other questions:

1. We've heard fewer complaints about the reliability problems encountered by some people who bought early models of the Adam. (It should be noted that early production models of virtually all new computers are subject to reliability problems as manufacturers fix last-minute design bugs and get their production up to speed—and that includes low-end home computers such as the Adam to high-end business computers such as the IBM PC-AT.) The possibility of accidentally erasing the Adam's SmartBASIC *tape still seems to exist, but Coleco now cautions users against this mistake. And although the basic design of the Adam system has not been changed, additional peripherals have become available, such as a floppy disk drive.*

2. There was no rush by third-party (non-Coleco) software publishers to sell programs for the Adam. However, in the past year Coleco expanded its own line of software; you should check this out to see if the software you need is available before buying an Adam. By adding an optional operating system—Personal CP/M—a large library of CP/M-compatible programs will work on the Adam. CP/M was the dominant operating system for business computers before MS-DOS, so thousands of business application programs and programming utilities are available.

3. COMPUTE! *has no plans to publish programs written specifically for the Coleco Adam. Coleco designed* SmartBASIC *to be compatible with Applesoft, so you might try entering some BASIC listings intended for the Apple. However, be aware that the Adam and Apple have very little in common internally—even the central processing units are different (the Z80A versus the 6502). That means the machine language is incompatible, and Applesoft programs with PEEKs, POKEs, and CALLs will have to be extensively translated. Also, Apple programs would not take advantage of the Adam's more advanced features, such as sprite graphics and sound.*

Speeding Up Basic

While reading your article "MSX Is Coming" in the January 1985 issue of COMPUTE!, I was inspired to make a few observations about your bubble sort example. I think these comments would be useful to your readers.

I realize that your sort was not intended to be an example of optimized code, so please don't take my comments as criticisms. Rather, my comments are intended to point out some of the simple things that we frequently overlook when we're involved in some more massive programming task.

1. A bubble sort of the type illustrated always floats the largest number to the end of the array. On each succeeding float, the extent of the FOR-NEXT loop can be reduced. This results in progressively faster passes through the loops.

Example: Change lines 150, 170, and 190 to the following:

```
150 PRINT"SORTING":L=149
170 FOR K=0 TO L
190 NEXT K:L=L-1
```

A Printer For All Reasons

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If you have been looking very long, you have probably discovered that there are just too many claims and counterclaims in the printer market today. There are printers that have some of the features you want, but do not have others. Some features you probably don't care about; others are vitally important to you. We understand. In fact, not long ago, we were in the same position. Deluged by claims and counterclaims. Overburdened by rows and rows of specifications, we decided to separate all the facts — prove or disprove all the claims to our own satisfaction. So we bought printers. We bought samples of all major brands and tested them.

Our Objective Was Simple

We wanted to find that printer which had all the features you could want and yet be sold directly to you at the lowest price. We wanted to give our customers the best printer on the market today at a bargain price.

The Results Are In

The search is over. We hae reduced the field to a single printer that meets all our goals (and more). The printer is the GP-550 from Seikosha, a division of Seiko. We ran this printer through our battery of tests and it came out shining. This printer can do it all. Standard draft printing up to a respectable (and honest) 86 characters per second, and with a very readable 9 (horizontal) by 8 (vertical) character matrix. At this rate, you will get an average 30 line letter printed in only 28 seconds.

"NLQ" Mode

One of our highest concerns was about print quality and readability. The GP-550 has a print mode termed Near Letter Quality printing (NLQ mode). This is where the GP-550 outshines all the competition. Hands down! The character matrix in NLQ mode is a very dense 9 (horizontal) by 16 (vertical). This equates to 14,400 addressable dots per square inch. Now we're talking *quality* printing. You can even do graphics in the high resolution mode. The results are the best we've ever seen. The only other printers currently available having resolution this high go for $500 and more *without* the interface or cable needed to hook up to your computer.

Features That Won't Quit

With the GP-550 your computer can now print 40, 48, 68, 80, 96, or 136 characters per line. You can print in ANY of 18 font styles. You not only have the standard Pica, Elite, Condensed and Italics, but also true Superscripts and Subscripts. Never again will you have to worry about how to print H_2O or X^2. This fantastic machine will do it automatically, through easy software commands right from your keyboard. All fonts have true descenders.

One of the fonts we like best is "Proportional" because it looks most like typesetting. The spacing for thin characters like "i" and "l" are given less space which "tightens" the word making reading easier and faster. This is only one example of the careful planning put into the GP-550.

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The name says it all.

On my VIC-20, this reduces the program execution time from 6:35 to 4:52. This is 74 percent of the previous runtime. A similar time savings should apply to any machine.

2. If an arithmetic operation must be performed more than twice within a FOR-NEXT loop, the loop will usually execute faster if the operation is performed once and assigned to a variable, then used thereafter within the loop.

Example: Change lines 150, 170, 180, and 190 to the following:

```
150 PRINT"SORTING":L=149
170 FOR K=0 TO L:K1=K+1
180 IF A(K)>A(K1) THEN
    T=A(K):A(K)=A(K1):A(K1)=T:EX=1
190 NEXT K:L=L-1
```

On my VIC-20, this reduces the program runtime from 6:35 to 4:37. Note that this change was really beneficial only because the IF condition usually resolves to true, resulting in the subsequent requirement for three additions whenever it was true. If the IF condition were rarely true, application of the "do the addition once" rule might actually slow down the FOR-NEXT loop, unless the loop contained further statements requiring the same operation.

3. Generally, the more characters you feed BASIC to interpret, the longer it will take to interpret them. For speed-intensive applications in BASIC, such as sorting, one should make the variable names as short as possible. This lets the interpreter make its decisions slightly faster.

Example: Same as previous except that J is used in place of K1, and X is used in place of EX:

```
150 PRINT"SORTING":L=149
160 X=0
170 FOR K=0 TO L:J=K+1
180 IF A(K)>A(J) THEN
    T=A(K):A(K)=A(J):A(J)=T:X=1
190 NEXT K:L=L-1
200 IF X<>0 THEN GOTO 160
```

On my VIC-20, this reduces the runtime from the original 6:35 to 4:27. But more significantly, it is the *same* program as my previous example, but is 1 percent faster, just from shortening the variable names.

I'd also like to comment on another of your articles: "Which Computer Language Is Best?" ["The Beginner's Page," January 1985]. In your commentary on BASIC, I think you overlooked stressing the fundamental aspect of BASIC that makes it so appealing to so many of us—the fact that it normally is available as an interpreter. We can stop the program, make a change in a line, rerun the program, and see the result immediately without having to get bogged down in relinking and recompiling code. This makes it easy to use (which you did acknowledge) and facilitates experimentation, even by children, which in turn facilitates learning. I have worked with compiled BASIC before, and found that it involves the same frustrations in use as any other programming language that cannot be immediately run.

Mike Hale

Thanks for the tips. Many readers will benefit from your observations. As we pointed out, the sort program was generic so it could be implemented on many different computers without major modifications. The original version of the bubble sort benchmark is listed at the end of the next letter.

Kaypro Benchmark Test

I have been reading the series of articles on the MSX operating system which have appeared in recent issues of COMPUTE! [December 1984 and January 1985].

The benchmark program in the January 1985 issue ("MSX Is Coming, Part 2: Inside MSX") was of particular interest, since my old faithful Commodore 8032 showed up rather well. However, since I recently added a Kaypro 10 to my stable, I thought it worthwhile to test it with this program.

Using Kaypro's MBASIC Version 5.1, the benchmark program ran in a dazzling 4 minutes 21 seconds, more than a minute faster than the IBM PC, and two minutes faster than the Goldstar MSX.

Even more interesting, by replacing line 180 as follows:

```
180 IF A(K)>A(K+1) THEN SWAP
    (A(K),A(K+1):EX=1
```

the running time dropped to 3:16!

In earlier tests on my Kaypro, I had already established that MBASIC runs faster than C-BASIC, a compiled BASIC also included with the Kaypro.

Paul Becher

Remember that all benchmark test results should be taken with a grain of salt, as often the benchmark program can be revised to utilize the peculiarities of a certain computer or language for optimum effect.

Here's a listing of the program we ran for anyone who would like to try it out:

```
100 PRINT"CREATING ARRAY"
110 DIM A(150)
120 FOR J=1TO150
130 A(J)=151-J
140 NEXT J
150 PRINT"SORTING"
160 EX=0
170 FOR K=0TO149
180 IF A(K)>A(K+1) THEN T=A(K):A(K)=A(K+1
    ):A(K+1)=T:EX=1
190 NEXT K
200 IF EX<>0 THEN GOTO 160
```

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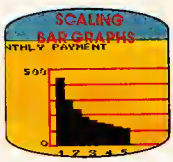

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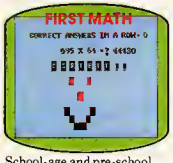

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Mattel Aquarius Benchmark

I am writing in response to your article in the January 1985 issue of COMPUTE! on the subject of MSX. My letter is actually based on my own applications with a recently purchased Mattel Aquarius system, and my frustrations in obtaining support, literature, and peace of mind in my attempt to decipher this elementary unit.

I ran your test program on my Aquarius (thank you for listing it in plain vanilla), and was quite surprised to find that it executed in only 4:35! Perhaps you might know why this is possible? The Aquarius uses the Zilog Z80 central processing unit, and it has a clock speed of only one megahertz.

I would truly appreciate any information or ideas in my attempt to crack the graphics, sound, machine language, etc., on my Aquarius.

Paul A. Linck

Your timing of 4 minutes and 35 seconds, if accurate, is indeed impressive—it places the Aquarius ahead of the fastest computer in the benchmark test, the IBM PC, which ran the program in 5:45.

We're at a loss to explain why the Aquarius is so fast at running this test. However, one factor may be the sparse BASIC, which can run faster because it isn't burdened by numerous extra commands. Also, no benchmark program is ever really a fair test for different kinds of computers; some benchmarks simply run better on some computers than on others. A different or slightly modified benchmark test might yield quite different results (as pointed out by columnist Bill Wilkinson in "INSIGHT: Atari," March 1985).

You don't say how much memory is installed in your Aquarius, but computers with less memory often tend to run faster than computers with more memory. Many users who have upgraded a machine from 16K to 48K or 64K have noticed that their favorite programs execute with just a little less zip. Recall how the Commodore VIC-20 placed near the top of the benchmark test—it has only 5K of RAM. Its 22-column by 23-line screen also requires less screen memory than other computers, so the refresh time is shorter.

Unfortunately, we can't help you in your quest for detailed information about your Aquarius. Evidently you purchased it at a closeout sale. The Aquarius suffered one of the shortest lifespans of any computer—it was discontinued by Mattel almost as soon as it hit the store shelves, a victim of the 1983 home computer price wars.

Changing Device Numbers

We both have Commodore 1541 disk drives and would like to know if we can connect them to use as a dual disk drive.

Bill Russell and Don Campbell

That's very easy with the 1541 disk drive; just change the device number. The device number is used in commands like **LOAD "PROG",8** *where 8 is the device number of the disk drive.*

There are two ways to change the device number of the drive—one by software, the other by cutting a jumper inside the drive itself. We'll assume you each want to continue using your drives independently at times, and just deal with the temporary device number change.

Changing the device number won't make your drives act as a Commodore 4040 dual drive, which is addressed with 0: and 1: for either drive 0 or drive 1. Your drives are still independent, they just have different device numbers. You cannot directly copy between the two drives as on a 4040 drive; you must use a copy program that moves the data between the drives via the computer.

To change the device number, first connect the main disk drive to the computer and attach the serial cable from the second drive to the spare plug on the back of the drive. (This is called daisychaining.) Now turn the power OFF for the drive you want to remain unchanged, and turn the power ON for the drive you wish to change.

Enter this short program:

```
10 INPUT "NEW DEVICE NUMBER";N
20 OPEN 15,8,15
30 PRINT#15,"M-W"CHR$(119)CHR$(0)
   CHR$(N+32)CHR$(N+64)
40 PRINT#15:CLOSE15
```

Run the program and enter a number from 8 to 15. This number will be the one you use to access the drive. When you run the program, line 30 will cause the error light to blink, but you can ignore this.

Now test that the device number has actually been changed by reading the directory. Assuming you changed the device number to 9, enter:

```
LOAD "$",9
```

then LIST to see the directory.

Now turn on the drive you previously turned off, and enter:

```
LOAD "$",8
```

To save to or load from the second disk drive, use **SAVE "filename",9** *or* **LOAD "filename",9**. *Also be sure to use the proper device number when OPENing and CLOSEing files.*

If you would like to operate more than two drives, just connect the other drives and turn them on, one at a time, and rerun the device number change program listed above. Each drive must have a unique device number.

This change is only temporary. When you turn your drive off, this change is reset, and the drive will return to using a device number of 8 when you turn it on again. Consult your 1541 manual to see how to permanently change the device number of a drive.

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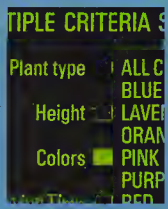

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A Piece Of Pi

The use of angular measurement in radians mentioned in one of your recent letters (COMPUTE!, December 1984) brings up another point. Where pi is not an intrinsic function of your computer, it is important how you define it in the program, especially when it is evaluated in sines and cosines and the result is compared to one or zero. Consider the following portion of a program:

```
30 B=SIN(A*(PI/180))
40 IF B=0 THEN GOTO 100
50 GOTO 10
```

where the value of the variable PI is defined earlier in the program and A is some variable you are interested in. If A reaches the value 180, we have SIN(PI)=0 or B=0 unless PI is not precisely equal to the value of pi as defined by your computer. This is a question of your computer's accuracy. PI should be defined as

```
5 PI=4*ATN(1)
```

where ATN is the arctangent function, which is present in almost every dialect of BASIC. This technique always defines PI to the accuracy of your machine by using an intrinsic function, whereas

```
PI=3.1416
```

or especially

```
PI=22/7
```

may not give B=0 (still assuming A=180). If you are unsure about the accuracy of your computer, always define PI as in line 5. If you do not, you may never exit a loop, or even worse, lose control of the program and get back the worst of all possible results—reasonable-looking garbage.

Kendall B. Smith

IBM BIOS Revealed

I recently purchased a Sanyo MBC-550 computer. This computer is (according to Sanyo) supposed to be 80 percent compatible with the IBM PC. It is my understanding that PC programs that bypass the BIOS will not run on my Sanyo. Can you explain what the BIOS is?

Jerry Watkins

BIOS stands for Basic Input/Output System. It's a collection of important machine language routines contained in Read Only Memory (ROM) which the computer uses to communicate with various devices such as the keyboard, screen, disk drive, and printer. Every computer has a BIOS, although it may be called something different. For example, Commodore calls it the Kernal, and Atari calls it the CIO (Central Input/Output).

Generally, you don't have to worry about the BIOS when programming in BASIC, because BASIC handles the BIOS for you. The BIOS is most useful when writing machine language programs. Each of the routines in the BIOS performs a specific function, such as printing a character on the screen or printer, reading the keyboard, getting the time of day, and accessing the disk or cassette drive.

The actual machine language for these routines will be slightly different for each model of the PC-series computers because of the different hardware configurations. In order to insure compatibility among various models, the BIOS routines are not accessed directly, but rather through interrupts. Each routine has its own interrupt number that stays the same with each model. (These interrupts are analogous to the Kernal jump table in Commodore machines.) This consistent numbering scheme enables PC-compatible computers such as the Sanyo MBC-550 to be mostly compatible with the PC even though the actual BIOS routines may be very different.

A program that bypasses the interrupts and accesses the BIOS routines directly will probably work only on a particular model. The same is true for a program that bypasses the BIOS altogether. For example, the program may have its own customized routine for printing to the screen instead of using the built-in BIOS routine. That way, the program can take advantage of the specific features of a particular model, but, of course, it sacrifices compatibility.

Atari DOS 2.0 Vs. 3.0

Can programs that require disks to be formatted in DOS 2.0 be formatted in DOS 3.0?

Scott Ciliberti

DOS 3.0 supports the enhanced storage space possible on the Atari 1050 disk drive, but will not work on the earlier 810 disk drive. Most software was written before the advent of the 1050 and was designed to use DOS 2.0. Some software includes DOS 2.0 on the disk. The problem is that a disk formatted in DOS 3.0 cannot be read from or written to by DOS 2.0. The reverse is also true. If the software boots up in DOS 2.0, it will not be able to read or write to your previously formatted DOS 3.0 disk. It may be possible to copy the software onto a DOS 3.0 disk. The software would boot up under DOS 3.0 and would be able to read and write DOS 3.0 disks (but not DOS 2.0-formatted disks). But you'll find this is almost impossible in practice, because most software is copy-protected. Since DOS 2.0 works just fine on the 1050 disk drive, stick with DOS 2.0 for most commercial software, and use DOS 3.0 for your own programming, if you like.

Because of various compatibility problems with DOS 3.0, Atari is considering replacing it with a new DOS dubbed 2.5 for development purposes. DOS 2.5 (or whatever it's called when released) may

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be available by this summer, and Atari is thinking about making copies available to current owners at little or no cost.

Lowercase On The TI

Lowercase characters on the TI-99/4A appear as small capital letters. In some of my programs, I'd like to have a normal lowercase character set. I've tried many times to redefine the lowercase letters, but my results have been disappointing. Could you provide me with some character definitions for lowercase letters?

Jim Tope

The following program redefines the lowercase character set with lowercase letters:

```
100 GOSUB 1000
110 CALL CLEAR
120 PRINT "abcdefghijklmnopqrstuvwx
    yz"
130 FOR I=1 TO 2000
140 NEXT I
150 STOP
999 REM LOWERCASE SET
1000 FOR I=97 TO 122
1010 READ A$
1020 CALL CHAR(I,A$)
1030 NEXT I
1040 RETURN
1050 DATA 0000003804 3C643C,00404040
     78444478,0000001C2020201C
1060 DATA 000404043C44443C,00000038
     4478403C,0018242070202020
1070 DATA 0000003844 3C0438,00404040
     78444444,0010001010101010
1080 DATA 0004000404042418,0020202 4
     28302824,0010101010101010
1090 DATA 0000006854544444,00000058
     64444444,0000003844444438
1100 DATA 0000007844784040,0000003C
     443C0404,0000005864404040
1110 DATA 0000003C40380478,0010103 8
     1010100C,0000004444444438
1120 DATA 0000004444282810,00000044
     44545428,0000004428102844
1130 DATA 0000004444 3C0438,0000003C
     0408103C
```

To use this lowercase character set in your programs, add the subroutine beginning at line 1000 containing the character definitions.

More Commodore Overheating

I have had a Commodore 64 for nine months, and am now experiencing problems. After an hour or so of use the bottom of the computer gets very warm, the computer locks up, and I lose everything not saved. Is there any remedy short of sending it back to Commodore?

Chuck Kutz-Marks

Your problem seems to be related to overheating, but it's impossible to tell from a letter exactly what is causing the problem. It could be caused by any one of a number of faults. Your best choice is probably to return your computer to Commodore, but first you may want to try some simple troubleshooting.

Try borrowing a power supply from a friend who has a 64 and see if the problem occurs again. If not, then your power supply has developed a thermal fault and needs to be replaced. Several independent sources sell power supplies.

You may also want to remove the foil-covered cardboard shield found inside most 64s. It's designed to cut down interference between the computer and a TV set, but it also traps heat.

If you or a friend is handy with hardware, you could locate the components responsible for the excessive heat and install a heat sink to draw out and dissipate the heat. But don't attempt this unless you're experienced at this kind of repair.

If you continue to have problems, your best bet is to contact Commodore's Customer Service Department by calling 215-431-9100 and arrange to return your 64 for service. Although this will take several weeks, it's probably your cheapest alternative.

Mixing Atari Graphics Modes

I own an Atari 1200XL computer. I've made a few BASIC programs of my own and I've been trying to get two graphics modes on the screen at the same time. For example, having GRAPHICS 1 at the top and GRAPHICS 2 at the bottom. Can you help?

James E. Sneed

A full explanation of modifying graphics modes is beyond the scope of this column, but try the following program. Set the variable G2 to the number of GRAPHICS 2 lines you'd like, then GOSUB 500. Lines 100–200 demonstrate the subroutine. This program modifies a GRAPHICS 1 display by POKEing in the display list bytes for GRAPHICS 2. You must not set G2 to less than 1 or greater than 11.

COMPUTE! *has published several articles on this topic in back issues, some of which are no longer available. For more information, refer to "How to Design Custom Graphics Modes" in* COMPUTE!'s First Book of Atari Graphics.

```
MD 100 G2=8:GOSUB 500
PI 110 FOR I=1 TO 24:? #6;"LINE ";I:N
       EXT I
FP 120 GOTO 120
MB 500 GRAPHICS 17:IF G2<1 OR G2>11 T
       HEN RETURN
GI 510 DLIST=PEEK(560)+256*PEEK(561)
KG 520 FOR I=29-G2*2 TO 28-G2:POKE DL
       IST+I,7:NEXT I
EA 530 POKE DLIST+I,65:POKE DLIST+I+1
       ,PEEK(560):POKE DLIST+I+2,PEEK
       (561)
HJ 540 RETURN                          ©
```

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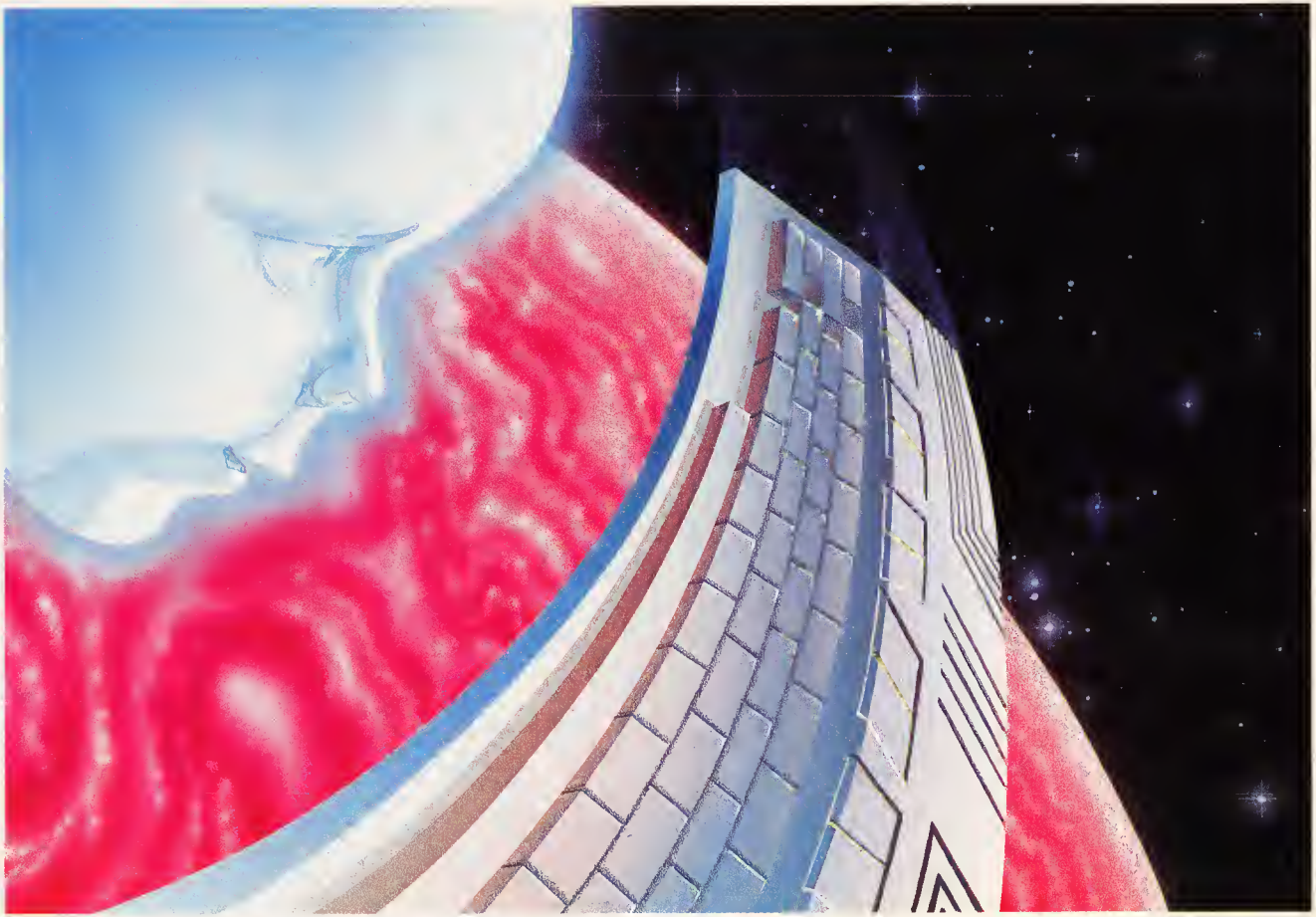


Illustration by Lee Noel

The Next Generation:

New Computers At The Winter Consumer Electronics Show

Tom R. Halfhill, Editor

What would you think of a 512K Macintosh-like computer faster than an IBM PC for under $600? Or a 3½-inch disk drive for under $150? Or a 15-megabyte hard disk for $399? Atari stunned the industry with these announcements and more at January's Consumer Electronics Show (CES). Commodore made plenty of noise, too, and together they gave everyone a glimpse of personal computing's next and best generation.

Atari boss Jack Tramiel set the tone for this trade show even before visitors arrived at their Las Vegas hotels. On desert land rented from the Howard Hughes estate along the route from the airport, Atari erected a series of huge Burma Shave-style billboards that declared:

PCjr, $599: IBM, Is This Price Right?

Macintosh, $2195: Does Apple Need This Big A Bite?

Atari Thinks They're Out Of Sight

Welcome To Atari Country
—Regards, Jack.

Not to be outdone, Commodore splashed two-page spreads in all the major trade papers, warning in ominous headlines:

Bad News For IBM And Apple

Underneath were pictures of a Little Tramp bowler hat and a bright red apple, skewered by arrows, sitting atop the new Commodore 128 Personal Computer. "At last, the $4 billion stranglehold on the personal computer market has been broken," trumpeted the ad copy.

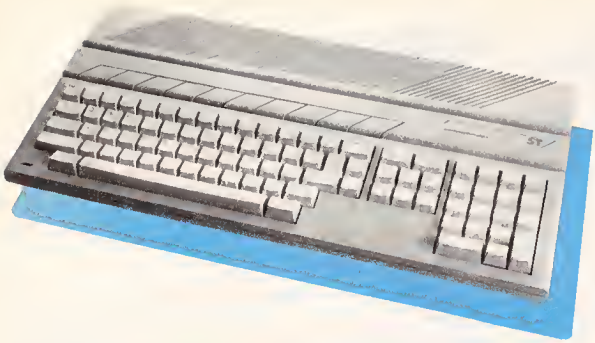
CES is anything but subtle, and these were merely the opening punches in what was probably the personal computer industry's most fascinating CES ever. Atari displayed a series of incredible computers at even more incredible prices that would seem impossible coming from anyone but Jack Tramiel. Commodore introduced a pair of new computers that would have won center stage at any other CES, if Atari hadn't stolen the spotlight. Thirteen Japanese companies coordinated their long-awaited debut of MSX-standard computers, but then stumbled badly by suggesting that their actual invasion of the U.S. market might be postponed yet another year. In another case of poor timing, Coleco cast out the Adam on the eve of CES, transforming its expensive exhibit into a paradise lost. Apple rented booth space at the show, but then rolled out at the last minute. And IBM decided not to come at all.

After the plague year of 1984, the first trade show of 1985 seemed to indicate that the industry shakeout may finally be ending. Texas Instruments, Mattel, Timex, Coleco, and numerous others are gone or severely weakened, leaving only a handful of surviving contenders. IBM and Apple dominate what is called the "high end," leaving Commodore and Atari to carve up what is called the "low end."

But traditional market boundaries, too, may be a victim of the shakeout. Above all else, this CES demonstrated that convenient terms like "low end" and "high end" are becoming as obsolete as the machines which now define them. The next generation of personal computers appears to be at last on its way.

"Power Without The Price" is Atari's new motto, and at CES it was seen everywhere—emblazoned on banners, imprinted on T-shirts, and most importantly, symbolized by the new computers themselves. In all, Atari announced six new computers and more than a dozen peripherals. Four of the new computers are eight-bit 6502 machines, said to be fully compatible with existing Ataris, while the other two are powerful 16/32-bit computers with a Macintosh-like operating system. The more powerful computers, officially called the ST series but nicknamed "Jackintoshes," stole the show. Here's why:

The brains of the new ST series computers is the Motorola 68000 microprocessor, the same 16/32-bit chip found in the Apple Macintosh. Clocked at eight megahertz, the 68000 central processing unit runs nearly twice as fast as the 8/16-bit 8088 chip that drives the IBM

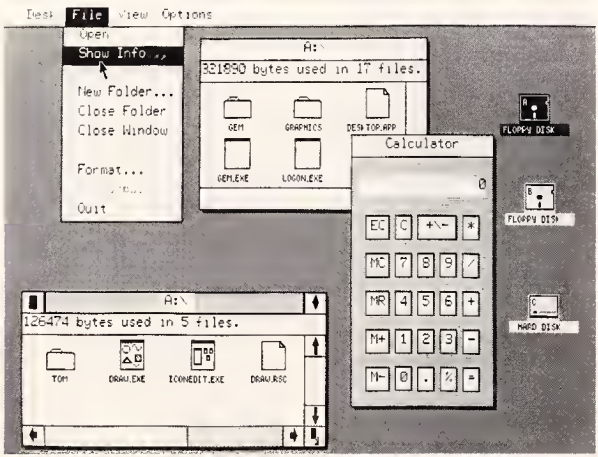


The Atari 520ST "Jackintosh": 68000 microprocessor, 512 colors, Macintosh-like operating system, and 512K RAM for an incredible $599. The 130ST is functionally and cosmetically identical but has 128K RAM and will sell for $399.

PC, PC-XT, and PCjr. The Atari 130ST and 520ST are mutually compatible and share most features in common, including 192K of Read Only Memory (ROM), expandable to 320K ROM with a plug-in cartridge; 512 colors; graphics modes of 320 × 200 pixels (16 colors), 640 × 200 pixels (four colors), and 640 × 400 pixels (monochrome); Centronics-standard parallel interface; RS-232-standard serial interface; floppy disk drive interface; hard disk interface; Musical Instrument Digital Interface (MIDI) for hooking up external synthesizers; two Atari-type joystick ports (one of which doubles as the mouse interface); TV output; composite color video output; monochrome video output; RGB (red-green-blue) high-resolution color video output; three-voice sound synthesizer with variable waveforms and envelopes; 94-key typewriter-style keyboard with separate numeric keypad, cursor keypad, and ten special function keys; Tramiel Operating System (TOS) in ROM; and Graphics Environment Manager (GEM) in ROM.

GEM is the Macintosh-like operating system interface originally developed for MS-DOS computers and licensed to Atari by Digital Research. GEM shields users from cryptic operating system commands by providing onscreen icons, drop-down menus, windows, and support for a two-button mouse controller. It also supports a realtime clock, hi-res vector drawing, and spritelike animation called *bit block transfer.* GEM bears an uncanny resemblance to the Macintosh's operating system; except for the color graphics, at a glance it's hard to tell a GEM screen from a Mac screen.

The only differences between the Atari 130ST and 520ST are the amount of Random Access Memory (RAM) and the price. Including all the features mentioned above, the 130ST has 128K RAM and will retail for $399; the 520ST has 512K RAM and will retail for $599. Atari says both computers should be available in the second quarter of 1985.



This typical GEM screen is the MS-DOS version, but the Atari ST version is virtually identical. Notice the drop-down menu, icons, and overlapping windows.

If you think those specifications and prices are hard to believe, wait until you hear about the peripherals.

For the ST series, Atari announced a 3½-inch microfloppy disk drive that will retail for under $150, possibly as low as $100. This drive uses the same Sony-standard disks as the Macintosh. The single-sided version stores about 250K; a double-sided version (to cost slightly more) stores about 500K.

Even more incredible was Atari's announcement of a hard disk drive for the ST series (and,

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under the AtariSoft label, for other brands of computers). When the show opened, Atari said it would sell a 3½-inch, nonremovable, 10-megabyte hard disk for under $600. That was amazing enough. Then a day later, speaking to a group of software publishers, Tramiel amended that announcement to a 15-megabyte hard disk for $399.

Coupled with an ST, either hard disk at anywhere near those prices would add up to unheard-of power in an affordable computer. The ST's built-in hard disk interface transfers data at 1.33 megabytes per second, about 100 times faster than a typical Macintosh hard disk. That means you could fill up a 520ST's entire 512K of RAM with a program or data in less than half a second. Or instantly page-flip between full-color, hires graphics screens from disk rather than from memory.

Not only are the ST computers far more powerful than existing home computers, they also potentially surpass the capabilities of most of today's 16-bit business computers. By promising the virtual equivalent of a "Fat Mac" with color for less than one-third the price, Atari is threatening to redefine the whole marketplace. Assuming that Atari can really deliver on its promises—and even in Las Vegas, not many people were taking odds against Jack Tramiel—a single computer selling for under $1,000 will be capable of tackling everything from videogames to the most sophisticated business programs.

Tramiel put it this way: "We aren't selling home computers. We aren't selling business computers. We're selling personal computers. People can use them for whatever they want."

Some observers were skeptical because the ST machines at CES were prototypes, not production models (not uncommon at trade shows). Atari still had not decided on certain critical features, such as whether the STs would include a built-in programming language, and if so, whether that language would be BASIC or Logo. The operating system wasn't completely finished, either. And like any new computer, the ST series may well suffer from a shortage of software during its first year, as has the Macintosh.

Still, Tramiel told software publishers at CES that there would be enough preproduction STs to go around in the first quarter to get things rolling. He offered technical and even financial assistance to promising software developers. And he said that when the new computers hit the market, Atari itself would introduce 20 to 30 software packages ranging from entertainment to education to business programs.

Some people are starting to refer to Tramiel as the Lee Iacocca of the personal computer industry, but The New Atari still has a long way to go. Haunted by the biggest corporate losses since Chrysler's dim days—and without the safety net of government loans—Atari is betting everything on the success of its new machines.

Atari 65XE: basically a remodeled 800XL for $99. Note the resemblance to the ST series. The 130XE, 65XEM, and 65XEP are similarly styled.

Although they were overshadowed by the ST series, Atari's four new eight-bit computers also were impressive. Dubbed the XE series (XL Extended), they are designed to be fully compatible with the older Atari 400/800 and XL series. Atari says some of the models already are in production and will be available in the first quarter.

First is the 65XE, basically an 800XL without the rear parallel interface connector (rarely used, anyway). The 65XE has 64K RAM, built-in BASIC, 256 colors, a four-voice sound chip, 11 graphics modes, five text modes, player/missile (sprite) graphics, international character set, a cartridge slot, serial bus for disk drives and other peripherals, two joystick ports, and all the other traditional Atari features. The redesigned case closely resembles that of the ST series computers, and the keycaps show the Atari graphics character set (à la Commodore). The retail price will be $99. There were conflicting reports, but it appears that the 65XE will replace the 800XL.

Next in line is the 130XE, a 65XE with 128K RAM and the rear parallel connector. The 130XE will sell for about $150.

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The third new eight-bit machine is an interesting variation of the 65XE called the 65XEM (XE Music Computer). It's a 65XE with an additional sound chip, the new eight-voice "Amy." Unfortunately, this was the only new computer Atari didn't exhibit at the show. However, those who have heard Amy say it outperforms even the SID synthesizer chip in the Commodore 64. Amy has a dynamic range exceeding 60 decibels, a frequency range of nearly 11 octaves from 4.8 hertz (far below human hearing) to 7.8 kilohertz, frequency resolution of 1/64 semitones, 64 harmonics, and many other features. Reportedly it can synthesize almost any musical instrument sound. The 65XEM will sell for about $150.

Finishing up the XE line is the 65XEP (XE Portable). It's really a transportable version of the 65XE and Atari's variation of the Commodore SX-64. The 65XEP packs all the 65XE features into a suitcase-sized package whose detachable lid becomes the keyboard. It contains a 5-inch green-screen monitor (instead of the SX-64's color monitor); a 3½-inch microfloppy disk drive (instead of the SX-64's 5¼-inch drive); and—unlike the SX-64—a rechargeable battery pack good for about three hours of use between charges. Atari says the 65XEP will sell for $399.

Atari users might be wondering why the 65XEP has a 3½-inch drive instead of the usual 5¼-inch drive. According to Leonard Tramiel, Atari has found a supplier who can make 3½-inch drive mechanisms cheaper than 5¼-inch mechanisms—and the microfloppies actually have more storage capacity. The 65XEP retains the standard Atari serial bus, so an Atari user who buys an XEP as a second computer could plug in a 5¼-inch drive and transfer his existing software onto the microfloppies. The 3½-inch mechanisms also are likely to show up in outboard drives for the other XE models as well as older Atari computers.

In addition to this avalanche of new Atari computers, there was a wide selection of new Atari peripherals. Exact retail prices and availability dates were not confirmed, but here's a brief rundown:

- XM148 monochrome monitor with built-in 80-column video adapter for the XE series and existing Ataris. This plugs into the serial bus and brings 80-column capability within reach of all Atari owners. It was shown on a 65XE running *AtariWriter Plus*, a new 80-column version of the popular *AtariWriter* word processor cartridge. Estimated price: $150.
- XC141 14-inch composite color monitor for the XE series and existing Ataris. Estimated price: under $250.
- XM301 300 bits-per-second, direct-connect modem. Estimated price: under $50.
- Six printers for the XE series and existing Ataris, including the XTM201 dot-matrix thermal, 20 characters per second (about $99); the XTC201 dot-matrix color thermal, 20 cps (about $99); the XDM121 daisywheel letter-quality, 12 cps (about $150); the XMM801 dot-matrix, 80 cps (about $150); and two redesigned printers, the 1025 dot-matrix and 1027 letter-quality (about $150 each).
- Two monitors for the ST series, including the SM124 hires 12-inch monochrome monitor (one prototype had a built-in 3½-inch disk drive); and the SC1224 RGB 12-inch color monitor. Estimated prices: under $200 (without drive) and under $300, respectively.
- Three printers for the ST series, including the ST504 dot-matrix color thermal, 50 cps (about $150); the SDM124 daisywheel letter-quality, 12 cps (about $200); and the SMM804 dot-matrix, 80 cps (about $150).

Atari won most of the attention at this CES, but the Commodore exhibit featured two interesting new computers and was consistently crowded, too—an indication that Commodore is still on its feet after the tumultuous events of the past year. The phenomenally successful company that Jack Tramiel founded three decades ago and then left in January 1984 after a management dispute has experienced a lot of turnover in the past 12 months. Numerous executives and engineers have defected to join Tramiel at Atari (so many, in fact, that some people call the new Atari "the new Commodore"). Commodore also has been struggling with its Plus/4 and 16 computers, and now faces more aggressive pricing from its resurrected competitor.

Still smarting from widespread criticism over the Plus/4, Commodore was careful to make its newest desktop computer Commodore 64-compatible. Named the Commodore 128 Personal Computer, it's actually three computers in one. It contains a complete Commodore 64, with 6510 microprocessor, VIC-II video chip, SID synthesizer chip, and 64K RAM; a 128K RAM computer with an 8502 (6502/6510-compatible) microprocessor and 40/80-column video; and a 128K RAM computer with an eight-bit Z80A microprocessor and 80-column video that is compatible with software designed for the CP/M operating system (Control Program for Microcomputers). The Commodore 128 is expandable to 512K RAM in 128K increments, although the extra memory must be used as a RAM disk, not contiguous program memory.

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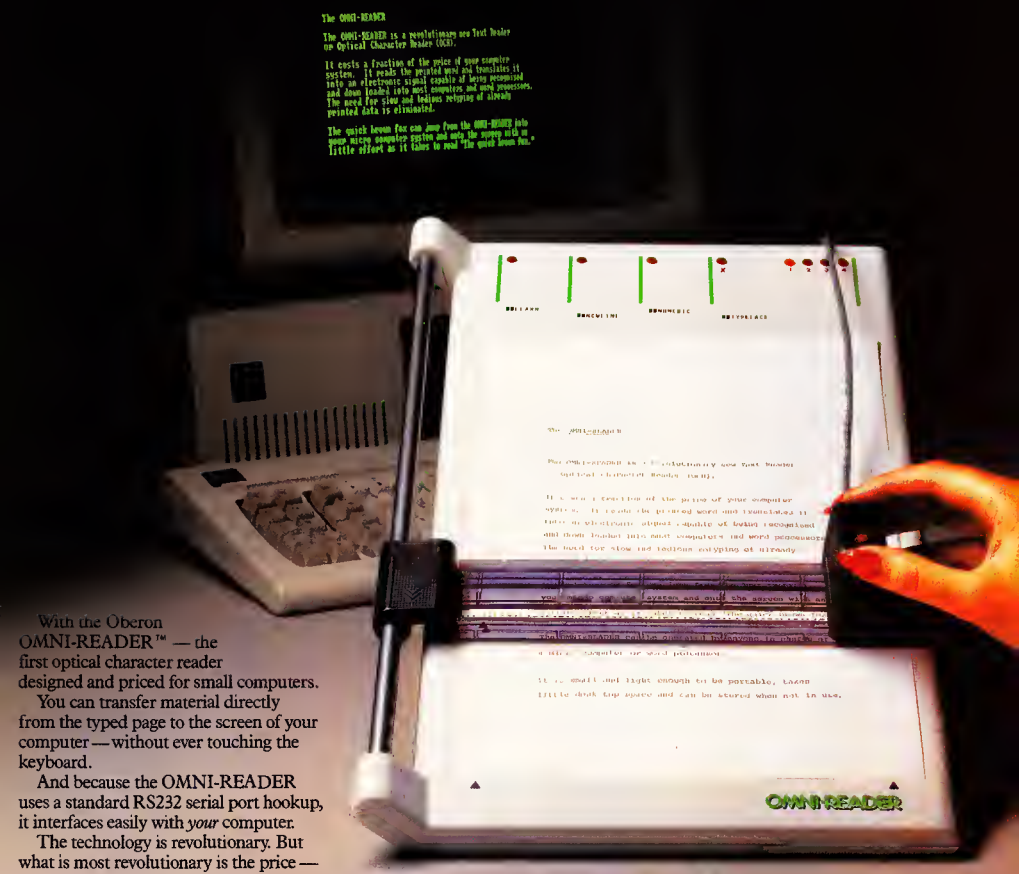

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Commodore announced no prices at the show, but indications are that the Commodore 128 will retail for under $300. It is scheduled for introduction in April or May.

Obviously, the Commodore 128 is much more than just the 128K RAM version of the Commodore 64 that was anticipated. When first switched on, the machine defaults to the 128K RAM 8502 mode. You can select 40- or 80-column video in this mode, but graphics and sprites are available only in 40-column video. To enter CP/M mode, you load a CP/M 3.0 disk that comes with the machine. To enter Commodore 64 mode, you type GO 64. The screen blanks for a few seconds, then flips to the standard Commodore 64 title screen. Once in 64 mode, there's no way to exit without rebooting the computer. This was done to keep 64 mode completely compatible. Otherwise, the operating system would have to be changed to accept a command such as GO 128. For the same reason, 80-column video is not available in 64 mode.

So how compatible is it? "We didn't change a single byte in the Kernal," said one Commodore engineer. Although COMPUTE! didn't have time at CES for exhaustive tests, we did successfully run the *SpeedScript 3.0* word processor in 64 mode.

The Commodore 128 has two built-in BASIC languages—the usual BASIC 2.0 in 64 mode, and BASIC 7.0 in 128 mode. BASIC 7.0 is the most powerful Commodore BASIC ever, with the same BASIC 4.0 disk commands found on the CBM 8032 and Plus/4, plus sound and graphics commands like those found in the *Super Expander 64* cartridge. In CP/M mode, a wide variety of disk-based languages are available, including compilers and assemblers.

Other Commodore 128 features include: 92-key typewriter-style keyboard with separate numeric keypad, two sets of cursor keys, four special function keys, and other new keys labeled ALT, ESC, TAB, CAPS LOCK, HELP, LINE FEED, 40/80 DISPLAY, and NO SCROLL; TV output; composite color video output; RGB video output; chroma/luma video output; audio output; 16 colors; machine language monitor; and all the same ports and interfaces found on the Commodore 64.

Commodore 128 Personal Computer: a unique three-in-one machine, containing a 64K Commodore 64, a 128K Commodore 64, and a Z80 CP/M computer.

The Commodore 128 is not as powerful as the new Atari ST series, but it embodies a similar philosophy: Offer an all-in-one computer that can tackle a wide variety of home, personal, and business applications—at an affordable price. With its Commodore 64 mode, the Commodore 128 already has a large up-to-date pool of educational, entertainment, and personal productivity software. In 128K mode with BASIC 7.0, it's much easier to program than a Commodore 64. And in CP/M mode, thousands of serious application programs are available. Although CP/M has been superseded by MS-DOS in the IBM PC-compatible business world, CP/M remains adequate for many small business tasks.

Complementing the Commodore 128 are some interesting new peripherals. Foremost is the 1571 disk drive, a versatile device itself. When the Commodore 128 is in 64 mode, the 1571 acts just like a 1541—it stores 140K per 5¼-inch floppy and is somewhat slow. But when you switch the computer to 128K mode, the 1571 speeds up considerably—about fivefold, in fact. It also operates as a double-sided drive in this mode, storing 350K per disk. Finally, when the Commodore 128 is switched to CP/M mode, the 1571 speeds up even more—about 12 times faster than a 1541—and increases storage to 410K per disk. In addition, in CP/M mode the 1571 can read CP/M disks in IBM System 34 format, including Osborne and Kaypro disks.

As if that weren't enough, the 1571 also works with the Commodore 64 and Plus/4 (in 1541 mode only), and with Commodore's new portable computer.

Two new monitors were announced for the Commodore 128: the 1901 Monochrome Monitor (ideal for 80-column business applications), and the 1902 RGB/Composite Monitor, which can display readable 80 columns in color. Commodore also showed a prototype of a mouse controller for the 128,

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but was unsure when the product would be marketed. No prices were announced for any of these peripherals, but all are scheduled for introduction at about the time the 128 hits the stores.

Not exhibited at CES but promised for later this year was the 1670 Modem, a 300/1200 bps unit that may be sold for as low as $100. The 1670 works with the Commodore 64, 128, and Plus/4, and also has autoanswer/autodialing and automatic baud rate switching.

Commodore LCD: a second-generation lap portable with 80 × 16 flip-up display, 32K RAM, internal modem, and eight built-in programs for under $600.

Commodore's new portable computer—the Commodore LCD—attracted at least as much attention as the 128, which surprised some company executives. A second-generation lap portable, the Commodore LCD has a flip-up 80 × 16 liquid-crystal display that's the fastest we've ever seen. When closed, it forms a cover that protects the 72-key typewriter-style keyboard.

Standard features include an eight-bit 65C102 microprocessor; 32K of RAM and 96K of ROM; RS-232-standard serial port; Centronics-standard parallel port; bar code reader interface; serial port compatible with Commodore 64 peripherals and the 1571 disk drive; memory expansion port; 300-bps autoanswer/autodial modem; BASIC 3.6; machine language monitor; and eight built-in programs. There's a word processor, notepad, spreadsheet, file manager, terminal emulator, calculator, scheduler, and address book. However, the Commodore LCD at the show was a prototype and not all of these programs were working.

Small enough to fit in a briefcase, the Commodore LCD weighs about three pounds. It runs on four AA batteries or an external power supply, and maintains data in RAM even when the computer is turned off. Estimated price is about $600—very competitive with lap portables already on the market.

Another important Commodore announcement at CES was a new service network consisting of 160 RCA service centers, about 800 Sears stores, and nearly 1300 other locations such as computer shops. They will service Commodore computers and peripherals, in or out of warranty, beginning in March.

Although it was an impressive Winter CES for Commodore, the company is saving its most powerful machine for later this year: the Amiga Lorraine. A prototype of this advanced computer was glimpsed at the last CES when Amiga was still an independent company searching for funding. In an acquisition that snatched Amiga from underneath Jack Tramiel's nose (and provoked a lawsuit), Commodore gained rights to market the Lorraine. The Lorraine is similar in power to the Atari ST series and uses the same 68000 microprocessor. But it may offer even more features, such as voice synthesis, better graphics and sound, and greater expandability.

Commodore wasn't talking about the Lorraine at this CES, except to confirm that the supermicro is nearing completion and should sell for under $1,000. Amiga founder David Morse, now working on the Lorraine for Commodore, told COMPUTE! that the computer may be announced shortly before the Summer CES in June so Commodore won't have to share the spotlight with anyone else—especially Atari. (Atari is rumored to be developing an even more powerful, full 32-bit machine.)

IBM and Apple are, of course, watching all these developments closely. Neither of these giants, despite the aggressive price/performance challenges from Atari and Commodore, is expected to drastically slash prices. The infamous 1982–83 price war that blasted Texas Instruments and severely damaged Atari is fresh in everyone's mind. For the next few months, at least, Apple and IBM are expected to play wait-and-see. ©

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COMMODORE 64

COMPUTE!'s Guide To Computer Camps

Sharon Darling, Research Assistant

With the snows of winter a memory and warm weather approaching, it's time for computing families to start considering which, if any, computer camps they want to attend this summer. We've compiled a list of camps nationwide which offer a variety of activities for computing enthusiasts of all ages. While it is by no means an exhaustive list of all the computer camps available, it is a representative sampling which should get you started on the right track.

In the accompanying chart, you'll find information to help you decide which kind of camp is right for you: location, basic curriculum, prices, time spent on computers daily, what types of computers are available, sex and age-range of campers, non-computing activities available, registration deadlines, staff-to-camper and computer-to-camper ratios, and names and addresses for more information. In the sessions/prices column, we've also indicated whether the camp is a day or residential camp.

While the majority of camps are for children and teenagers, there are others which families can attend together. There are also camps for adults only. Keep in mind other considerations when deciding which camp is best for you: qualifications of the instructors, curriculum structure, and groupings of campers by computing experience and ability. Most camps include all necessary equipment (hardware and software) in the cost, but some ask that campers supply their own computers.

Computer camps not listed here may wish to notify COMPUTE! of their programs for possible use in a future issue.

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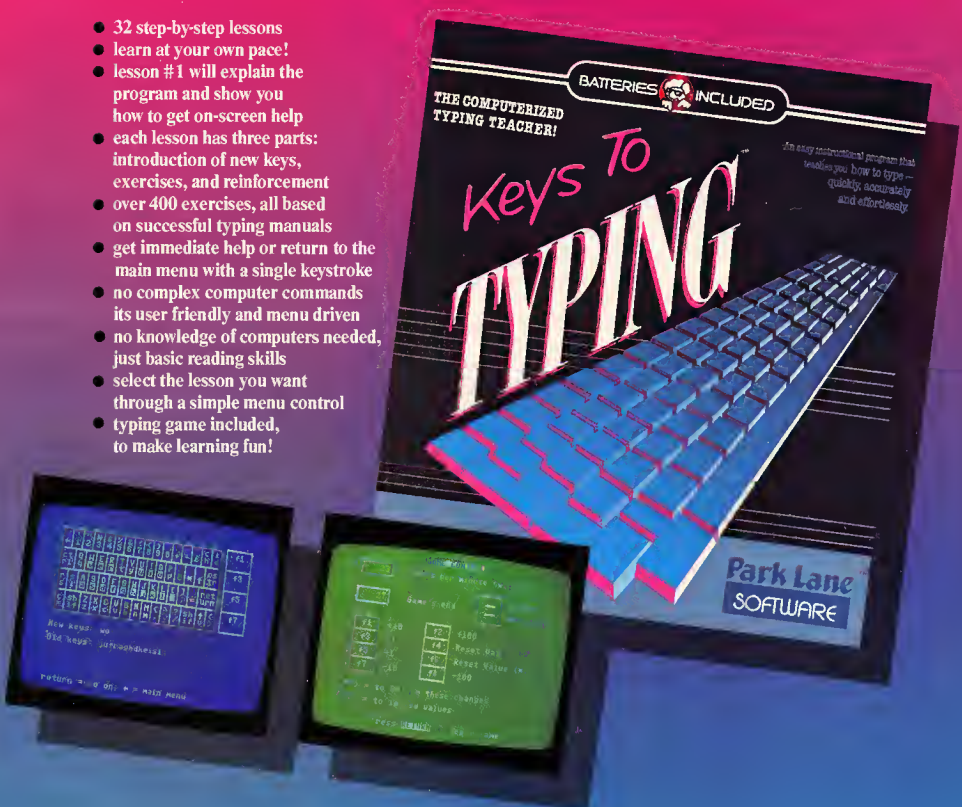

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Camp name/address	Camp location(s)	Sessions/prices	Curriculum	Computers available	Staff/camper ratio	Computer/camper ratio	Time spent daily on computers	Sex, age range of campers; # campers per session	Noncomputer activities	Registration deadline
UAB Microcomputer Camp, Ray Holland, 917 11th St. S., Birmingham, AL 35294; (205) 934-3870	University of Alabama in Birmingham	3 weeks/$275; day	Programming; class and lab sessions	Apple II+	1:5	1:1	5 hrs. class time; 2 hrs. free time	Coed; 13–16; 40 per session	None	June 10
Arizona Computer Camp, Dr. Henry Dahlberg, 2946 Darca Dr., Prescott, AZ 86301; (602) 445-3778	Prescott, AZ	1 week or 2 weeks; $285 per week; res.	Logo, BASIC, applications software, graphics	Apple IIe	1:3	1:1	3 hrs. class daily; 2 hrs. per week free time	Coed camp; ages 8–15; 60 per session	Include sports, fishing, camp-outs, astronomy	June 15
Genesis Computer Camp, Dr. James Holliday, Box 3143, John Brown University, Siloam Springs, AR 72761; (501) 524-3131	JBU, Siloam Springs, AR	1 week/$125; day	BASIC, Pascal; individual hands-on instruction	IBM PC, Apple II+, IIe, Com. 64	1:5	1:1	6–8 hrs. class; 2 hrs. free time	Coed camp; ages 10–17; 25 per session	None	Beginning of session (June 17 or June 24)
Pegasus '85, Anne Nicksic, University Extension, University of California, Davis, CA 95616; (916) 752-6401	University of California, Davis campus	1 week, 9 a.m.–12 noon/$150; 9 a.m.–3 p.m./$250; day & res.	Problem solving/programming in BASIC, Logo, Pascal	UNIX, Apple IIe	Maximum 1:8; usually 1:5	1:1	3–5 hrs. class time, depending on camp length; 1–3 hrs. free time	Coed; jr. and sr. high school; 25–40 per session	Swimming, recreational area	One month before date of first camp meeting
United States International University Computer Camp, Maggie Kositany, 10455 Pomerado Rd., San Diego, CA 92131; (619) 271-8582	San Diego, CA	2 weeks/$850; res.	BASIC, Pascal, assembly; seminars in graphics, music, robotics, artificial intelligence	Apple IIe	1:5 staff; 1:8 instructors	1:1	4 hrs. instruction; 6 hrs. free time	Coed; 7–17; maximum 40 per session	Include sports, arts and crafts, hiking, jet skiing	Applications accepted April 2 until full
The Original Computer Camp, Inc., Mark J. Zacovic, 559 San Ysidro Rd., Dept. CM, Santa Barbara, CA 93108; (805) 969-7871	Sequoia Lake, CA, Sierra Nevada Mountains, Cate School	12 days/$895 + $50 canteen fee; res.	BASIC, Logo, Pascal, Robotics, 6502 assembly language, Forth, graphics, arcade game writing	Apple II+, Com. 64	1:4	1:1	Minimum 3 hrs., maximum 5–6 hrs.; 1½ hrs. free time	Coed; 7–15; 80–100 maximum per session	Include team sports, swimming, arts and crafts, movies	Early spring
Cali-Camp Computer Camp, Cali-Camp Summer Camps, Pam Hawley, 1717 Old Topanga Canyon Rd., Topanga, CA 90290; (213) 455-1305	Malibu Mountains, CA	10 days/$405 regular; $386 discount	Computer lab; topics include theory, keyboard instruction, programming, graphics	Apple IIe	2:16	1:2	2½ hours class; 45 min. free time	Coed; 7–14; 32 per session	Wide variety of activities and field trips	None
University of Colorado Computer Camp, Suzanne Kincaid, c/o Academic Computing Services, Campus Box 455, U. of Colorado, Boulder, CO 80309	University of Colorado, Boulder	6 days/$425 residents; $225 commuters; day & res.	Programming, applications, communications, electronic mail	IBM PC, Apple, Zenith, VAX	1:10	1:1	Approx. 6 hrs. class time; 2–3 hrs. free time	Coed; 14–19; 32 maximum	Include water sports, ice skating, team sports, hiking	June 1
Hemlocks, Carl Larson, Hemlocks Outdoor Education Center, P.O. Box 198, Hebron, CT 06248 Note: Camp serves physically disabled children exclusively.	Hebron, CT	12 days; 6-day option/$300 per week, ability-to-pay for CT residents; res.	BASIC, computer literacy, word processing, use of adaptive equipment	IBM PC, Apples	3:10	1:2	4–6 hrs. class time; 1 hr. free time	Coed; 10–17; 65 per session	Include adaptive sports and games, water sports, hiking, ropes course	August 1
New England Computer Camp, Clark Adams, Banner Lodge, Moodus, CT 06469; (203) 873-1421	Banner Lodge, Moodus, CT	2 weeks/$945; res.	BASIC, assembly, C, LISP, Logo, Pascal; applications; electronics; utilities; peripherals; hardware	Apple IIe & IIc, Macintosh, IBM PC & PCjr	1:4	1:1	5–8 hrs. class time; 1–3 hrs. free time	Coed; 8–17; 125 per session	Include professionally taught circus program; field sports, tennis, newspaper, swimming, tennis	May 15
National Computer Camps, Michael Zabinski, Box 585, Orange, CT 06477; (203) 795-9667	Simsbury, CT; Atlanta, GA; Cleveland, OH; Portland, OR; St. Louis, MO; Washington, DC	1 week sessions/$380 per week; res.	BASIC, Pascal, machine language; artificial intelligence, robotics; computer literacy	Apple, TRS-80, IBM	1:6	1:2	5 hrs. instruction, 5 hrs. free time	Coed; 9–18; 100 per session	Include swimming, tennis, field sports, indoor sports, *Dungeons & Dragons*	Applications accepted until camp is full
Sun Valley Computer Camp, Brad Thode, P.O. Box 1450, Hailey, ID 83333; (208) 788-2164 or 788-4958	Camp Sawtooth, Boulder Mountains in central Idaho	1 week/$350; res.	BASIC, Pascal, Logo; spreadsheets, databases, word processing	Apple, Com. 64	1:5	1:2	6 hrs. class; 1½ hrs. free time	Coed; 8–16; 50 per session	Include environmental, volleyball, swimming	June 30
Computer Day Camps, Kitty Pfutzenreuter, Education Dept., Museum of Science & Industry, 57th & Lake Shore Dr., Chicago, IL 60637 (312) 684-1414, ext. 422	Museum of Science & Industry	5 days/$230 for members; $245 nonmembers; 2 days/$110 members; $125 nonmembers; day	Programming; opportunity to program doll house and army tank	TRS-80, Apple IIe & II+, IBM PC, Com. 64, PET, TI	1:10	1:1	3 hrs. exclusive use	Coed; 10–15; 40 per session	3 hrs. science activities daily	Registration opened Jan. 1; applications accepted until full
IER Computer Camps, Sandra Cunningham, 793 N. Main St., Glen Ellyn, IL 60137	Chicago suburbs — north, west, and south	11 day sessions/$225 (9 a.m.–3 p.m.) Logo sessions (9 a.m.–noon, $125); day	Individual instruction in BASIC, Logo, Pascal, robotics, graphics, music, depending on campers' skills	Apple IIe	1:10	1:1.5	6 hrs. instruction; 30 min. free time	Coed; 6–17; 40–120 per session	None	2 weeks before start of session
Lincoln College 1985 Commodore Computer Camp, Rob Widmer, 300 Keokuk St., Lincoln, IL 62656; (217) 732-3155 Note: Campers asked to furnish equipment; some rentals available.	Lincoln College	5.5 days/$280 + housing, meals, and equipment rental	Various levels BASIC & ML programming; disk operations, COMAL, sound and graphics, hardware	Com. 64, PET, Super PET, CBM, Plus/4	1:7	1:1	5 class hrs.; 8–10 hrs. free time	Coed; primarily adults but no age cutoff; 75 maximum per session	Swimming, tennis	May 1

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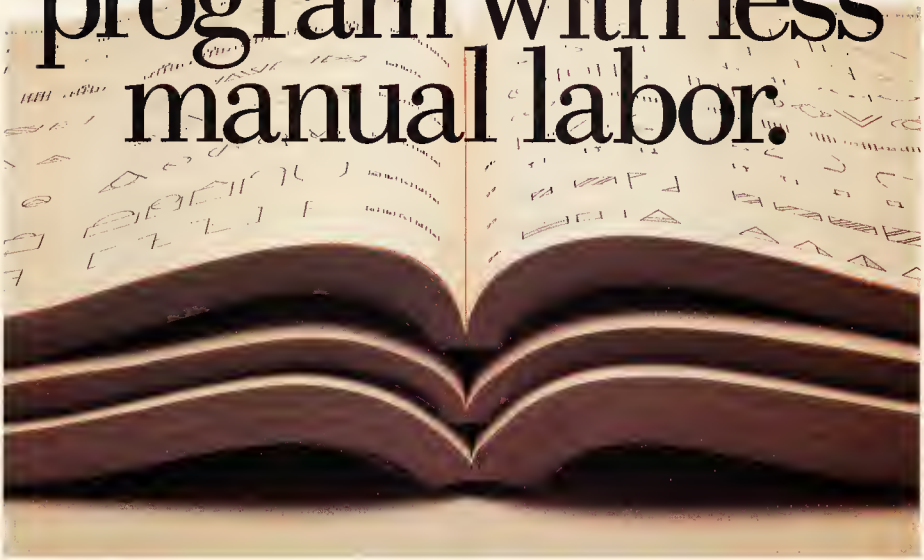
Camp name/address	Camp location(s)	Sessions/prices	Curriculum	Computers available	Staff/camper ratio	Computer/camper ratio	Time spent daily on computers	Sex, age range of campers; # campers per session	Noncomputer activities	Registration deadline
Science/Computer Camp, Kitty Pfutzenreuter, Education Dept., Museum of Science & Industry, 57th & Lake Shore Dr., Chicago, IL 60637; (312) 684-1414, ext. 422	Pilgrim Park Camp, Princeton, IL	2 weeks/$640 members; $660 nonmembers; 6 night option/$335 members; $350 nonmembers; res.	Programming using computers in connection with science problem solving	Apple IIe, Com. 64, IBM PC, TRS-80	1:5	1:1	2 hrs. class time; optional evening lab	Coed; 10–15; 90 per session	Include science activities, swimming, team sports, stress/challenge course	Registration opened Jan. 1; applications accepted until full
Goshen College Computer Seminar, Doug Caskey, 1700 S. Main St., Goshen, IN 46526; 800-348-7422: IN residents call (219) 533-3161	Goshen College	1 week/$140 + $20 for textbooks; res.	Programming, computer literacy, graphics, Pascal, BASIC, robotics	VAX 11/750, Apple IIe, IBM PC	1:6	1:1	6 hrs. class; 4 hrs. free time available	Coed; grades 10–12; 25–30 per session	Include volleyball, videogames, movies	June 14
Midwest Computer Camp Inc., Liz Moore, 9392 Lafayette Rd., Indianapolis, IN 46278; (317) 297-2700	Indianapolis, IN	1 week/$400; 2 weeks/$750; res.	Includes BASIC, Logo, PILOT, assembly, robotics, graphics, music, speech	IBM, Apple, Atari, Commodore, TI-99, Radio Shack	1:3	1:1	Minimum 6 hrs. class time; up to 2 hrs. free time	Coed; 7–18; 60 per session	Include swimming, astronomy, wildlife, team sports, camp crafts	Discounts prior to March 1, 1985
YMCA Camp Crosley, Terry Jones, 500 S. Mulberry, Muncie, IN 47305	Tippecanoe Lake, North Webster, IN	1 week/$200; res.	Programming, computer literacy	TRS-80, Model III	1:5	1:1	3 hrs. class time; 1 hr. free time	Coed; 8–15 (adult weekends also available); 10 per session	Include water skiing, sailing, crafts, sports, fishing	2 weeks prior to session attending
The New RETUPMOC, Dr. Cary Laxer, Rose-Hulman Institute of Technology, 5500 Wabash Ave., Terre Haute, IN 47803; (812) 877-1511	Rose-Hulman Institute of Technology	1 week (BASIC & 8088 assembly)/$275; 2 weeks (FORTRAN & Pascal)/$550; res.	Alternating lectures & lab time; BASIC, FORTRAN, Pascal, 8088 assembly	VAX 11/750, PDP 11/70, IBM PC	1:9	1:1	4–6 hrs. class time; 2–3 hrs. free time	Males who have completed soph. yr. of hs; 35 per session	Full range of athletic facilities & off-campus events	June 1
Summer Computer Institute, Galanter Computer School, Inc., 460 Riverside Dr., NY, NY 10027; (212) 222-3344	Amherst College, Amherst, MA	1 week/$1,295; res.	Programming and applications	IBM, Kaypro	5:1	2:1	13 hrs. class time; free time as desired	Coed; 17–88; less than 20 per session	Include swimming, tennis, museums	June 1
Computer-Ed Camps, Computer-Ed, Inc., Dr. Robert Linstone, 99 School St., Weston, MA 02193; (617) 647-0054	Residential camps: Babson College, Wellesley, MA, and LaSalle Academy, Long Island, NY; 1 week session for gifted and talented	2 weeks/$895; 1 week for gifted students/$550	Includes Logo, BASIC, Pascal, C, assembly language, CP/M, graphics, game programming, robotics, LISP, artificial intelligence	Include Apple, IBM, Commodore, Acorn	1:4	Varies, depending on course of instruction	Campers spend approx. 65% of time in computer-related activities	Coed; 8–17; # per session depends on camp site	Wide range of activities	As soon as possible
Computer Ed Day Camps, address and phone same as above	Wellesley, Cambridge, Concord, & Plymouth, MA; Long Island, NY; Providence & Bristol, RI	2 weeks/$425	Same as above	Same as above	Same as above	Same as above	Approx. 50% of time spent in computer-related activities	Same as above	Same as above	As soon as possible
Compu-Tar, Jim Tartaglia, 72 Cambridge St., Worcester, MA 01603; (617) 757-6619	Throughout the northeast	1–2 weeks; cost depends on camp; res.	BASIC, Logo, computer literacy & software operation; graphics oriented	Apple IIe	Maximum 1:8	1:2	1–2 hrs. class time; up to 2 hrs. free time	Coed; 9–14; varies by camp	Full range of camp activities	Depends on camp
University Computer Camp, Susan Carlson, 2480 Crooks Rd., Troy, MI 48084	Pero Lake Lapeer, MI	2 weeks/$795; res.	Includes programming, graphic design, robotics, word processing	Apple IIe, Macintosh	1:3	1:1	4 hrs. class; 2 hrs. free time	Coed; 8–18; 100–120 per session	Include swimming, canoeing, crafts, hiking	May 1
Camp Lincoln/Camp Lake Hubert, Sam Cote, 3940 W. 49 1/2 St., Minneapolis, MN 55424; (612) 922-2545	Northern Minnesota	5 days/$90 + tuition for regular camp program; res.	BASIC, Logo, Pascal, keyboarding, graphics, music	Apple IIe	1:8 beginning; 1:5 advanced	1:2 beginning; 1:1 advanced	3 hrs. class time; 30 min.–1 hr. free time	Coed; 8–17; 10–15 per session	Include sailing, riding, riflery	Summer
Bronx YMCA Day Camp, #2 Castle Hill Ave., Bronx, NY 10473, (212) 931-2500	Bronx, NY	2 weeks/$20 + tuition for regular day camp	Introduction to BASIC, Logo, and computer literacy	Com. 64	1:5	1:2	1 hr./day, 3 days/week class time	Coed; 5–14; approx. 250 per session	Include swimming, field trips, sports	None
YMCA-YWCA Camping Services of Greater New York, Kent W. Sampson, Big Pond Rd., Huguenot, NY 12746; (212) 564-1300, ext. 312, 313, or (914) 856-4382	Huguenot, NY	2 weeks/$420 + $135 for computer instruction; res.	BASIC, graphics, speech	Apple IIe	1:8	1:4	2 hrs. class time; up to 2 hrs. free time	Coed; 8–15: 48 in computer program	Include athletic and waterfront programs, crafts, dance, drama	June 30
Premier Computer Camp, John Vitelli, Goshen St., Jewett, NY 12444	Jewett, NY	1 week/$425; 2 weeks/$795; 4 wks/$1,550; 6 wks/$2,265; 8 wks/$2,940; res.	Beginning through advanced	Apple, IBM, Commodore	1:4	1:1	4 hrs. class & lab time; free time as desired	Coed; 7–17; 50	Numerous	June 15
Marist College Computer Camp, Dr. Lawrence W. Menapace, Marist College, Poughkeepsie, NY 12601	Marist College	2 weeks/$875; res.	Programming; 50–50 lecture and hands-on laboratory	IBM PC, Apple, IBM 4341	1:5	1:1	3 hrs. class; 4 hrs. free time	Coed; 9–17; 60	Recreational, social, cultural program	Registration accepted until full

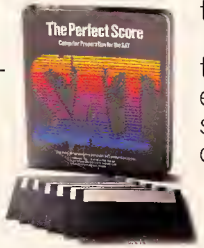
Choose the SAT program with less manual labor.



The idea behind choosing a computerized SAT program over a manual is to save you from piles of paperwork. But surprisingly, two of the best-known programs come with big, fat manuals and only 2 or 3 double-sided disks.

When that much information is put into the manual, what's left to put into the computer?

Why not buy a computer program that's really a computer program? Buy The Perfect Score from Mindscape for just $69.95.*



It has 6 double-sided disks and a real skinny manual. It even has printout capability and a continuous on-screen clock. All this makes The Perfect Score more computerized than those others.

Now, if this cold logic fails to convince you, perhaps an emotional appeal to your sense of patriotism and social consciousness will. Your choice is this. Either you buy their SAT, which kills innocent trees to make all that paper. Or you buy our SAT with 6 disks and Save America's Trees.

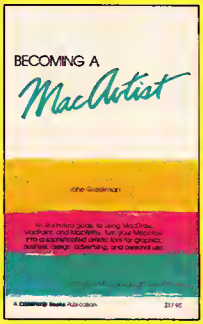
The Perfect Score, $69.95, from Mindscape

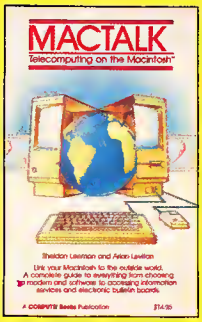
*Suggested retail price. Available for Apple, Commodore 64 and IBM. The Perfect Score: Computer Preparation for the SAT.

Camp name/address	Camp location(s)	Sessions/prices	Curriculum	Computers available	Staff/camper ratio	Computer/camper ratio	Time spent daily on computers	Sex, age range of campers; # campers per session	Noncomputer activities	Registration deadline
Family Computer Camp, Estella Bray, Conference & Information Center, Clarkson University, Potsdam, NY 13676	Clarkson University	1 week/$225 each for first 2 in family; $175 each thereafter; housing extra	Children: programming; adults, programming or applications	Z-100, Apple II, Atari, VIC-20	Varies with age group; from 1:3 to 1:10	1:1	5 hrs. class; 5 hrs. free time	Coed; 5–adult (children must be accompanied by adult)	Athletic facilities available, evening programs	When capacity reached
Camp Rockmont for Boys, Lake Eden Rd., Black Mountain, NC 28711; (704) 686-3885; contact David Bruce	Near Asheville, NC	2–4 weeks/$1,150 for 4 wks; res.	Includes beginning & advanced programming, game design	Apple IIe, II+	1:3	1:2	2 hrs. class; 1 hr. free time	Boys; 8–16; 400	Myriad	Early enrollment encouraged
Tar Heel Computer Careers Camps, Donald G. McLeod, P.O. Box 2328, Chapel Hill, NC 27514	Chapel Hill, NC	1 week/$350; res.	Computer literacy & BASIC; Pascal; emphasis on careers	Apple IIe	1:5	1:2	3.5 hrs. for 3 days, 5.5 hrs. for 2 days class time	Coed; rising hs jrs. and srs. and spring graduates	Numerous	Until class of 25 filled
Western Carolina University Computer Camp, Linda Patton, c/o Division of Continuing Education, WCU, Cullowhee, NC 28723	WCU campus	1 week/$295 resident camper; $195 day camper	Programming, use of printer, graphics	Apple	1:6 instruction & lab; 1:10 dormitory	1:2	3 hrs. class time; up to 3 hrs. free time	Coed; 10–13; 30	Indoor and outdoor recreational activities	June 30
Duke University Computer Kamp (DUCK), Pete Boyd/Shirley Greene, DUCK/Computer Science Dept., Duke University, Durham, NC 27706; (919) 684-5645	Duke University	1 week/$500 resident; $400 day camp; 2 wks/$800 resident; $600 day camp; 3 wks/$1,100 resident; $900 day camp	Class & lab combination; programming, field trips, guest speakers	IBM PC	1:5 lab; 1:15 residential life	1:1	3–4 hrs. class time; 6–7 hrs. free time	Coed; 8–17 and adult; 160	Include movies, team sports, skating, swimming	None, but discounts for early registration
Delphian School Summer Computer Camp, Mark Siegel, Rte. 2, Box 195, Sheridan, OR 97378; (503) 843-3521	Sheridan, OR	4 weeks to 11 weeks; cost from $1,295 to $1,495, depending on age, + fees for 13 & under; res.	Introductory & advanced programming, applications	Epson QX10, Molecular, TRS, Commodore, TI	Varies	1:1	Up to 7 hrs. class time; varies; labs open 24 hrs. a day	Coed; 10–adult; # per session varies	Include horseback riding, bowling, sports	None
Brigham Young University Computer Camp, Ivan Crespo, 297 CONF, BYU, Provo, UT 84602; (801) 378-6757	Brigham Young University	2 weeks/$595; 1 week/$395; res.	Beginning through advanced programming in BASIC, Pascal, machine language	Apple, IBM PC	1:5	1:1	Up to 7 hrs. class time; up to 3 hrs. free time	Coed; 10 and up; 40–50	Includes sports, hiking, making video movies	One week before camp starts
Champlain College Computer Camp, Maureen L. Genzlinger, P.O. Box 670, Suite 50, 163 S. Willard St., Burlington, VT 05402; (802) 658-0800	Champlain College, Burlington, VT	2 wks/$885; 4 wks/$1,725; res.	BASIC, Pascal, assembly, and productivity software; individual and group instruction	Commodore, IBM	1:5	1:1	4 hrs. class; 1.5 hrs. free time	Coed; 10–16; 120	Sports, arts and crafts, dance, photography	Applications accepted until camp is full
Legacy International Youth Program, Legacy, Deborah Friedman, 1141 N. Glebe Rd., Arlington, VA 22201; (703) 522-1407	Bedford, VA	3 weeks/$875; 6 weeks/$1,650; res.	Includes Logo, music, animation, telecommunications, word processing	Com. 64, Franklin Ace 1000	1:4 in class; 1:3 overall	1:1	1.5–2 hrs. per day	Coed; 9–18; 115	Include arts, communication, swimming, hiking, adventure	April 15
Virginia Tech Computer Camp, Norman R. Dodl, Room 400 Gym, Virginia Tech, Blacksburg, VA 24061; (703) 961-4850	Blacksburg, VA	2 weeks/$675; res.	Programming, literacy, architecture, robotics	Apple, IBM	1:3	1:1	4+ hrs. class time; 3+ hrs. free time	Coed; 10–17; 70–80	Full indoor and outdoor recreation program	June 15
COMPUTER FUNdamentals Camp at Hollins, Nancy R. Healy, P.O. Box 9715, Hollins College, VA	Hollins College	2 weeks/$200; day	Includes literacy, competency, Logo, BASIC, robotics, graphics, music, databases	VAX 11/780, IBM PC, Apple, Radio Shack, VIC-20, Atari, Sinclair	1:12	1:2	3.5–5.5 hrs. class time; 1 hr. free time	Coed; 8–18; 75–100	None	None given
Camp Edwards, Merrill Oleson, P.O. Box 16, East Troy, WI 53120	Lake Beulah, WI	6–12 days; $180–$273; res.	Literacy, beginning-advanced programming	Apple IIe	1:10	1:2	4 hrs. class time; 1–2 hrs. free time	Coed; 9–16; 140 (20 in computers)	Include sailing, skiing, riflery, crafts	Until filled
Mt. Rainer Computer Camp for adults and families, Dr. Susan A. Whitt, 9061 NE 34th, Bellevue, WA 98004-1234; (206) 453-8790	Mt. Rainier, Port Townsend, Seattle, and Gold Bar, WA	Weekends/$250; res.	Includes Logo, BASIC, literacy, word processing, spreadsheets, databases; individual projects	Apple IIe, IIc, Commodore, IBM compatibles	1:5 class; 1:8 overall	1:1 class; 1:2 overall	8 hrs. per weekend class time; 3–4 hrs. free time per weekend	Coed; 6–adult; 20 maximum	Vary, but include sleigh rides, skiing, fishing	2 weeks prior to camp selected
Mt. Rainer Computer Camp for children, address and phone same as above	Buck Creek Lodge, Greenwater, WA	6 days/$350; res.	Beginning-advanced BASIC and Logo; creative writing/word processing; build-a-computer; robotics	Apple IIe, IIc, Com. 64, Heathkit	1:5	1:1 in class; 1:2 overall	3 hrs. class time; 3–6 hrs. free time	Coed; 7–16; 60	Include horseback riding, swimming, soccer, art	July 1
Jackson Hole Personal Computer Resort, Patrick Going, Star Route, Box 362A, Jackson, WY 83001; 1-800-443-8616	Jackson Hole, WY	4 days/$295; res.	Introductory course with emphasis on business applications; seminars	IBM PC	1:10	1:2	5 hrs. class time; as much free time as desired	Coed; adults only; 10–12	Include white water rafting, snow and cross-country skiing	No official deadline

COMPUTE! BOOKS

Enjoy these newest releases for Apple's Macintosh computer.





Becoming a MacArtist
Vahé Guzelimian

This illustrated guide to Macintosh graphics shows the power and flexibility of *MacDraw*, *MacPaint*, and *MacWrite*. The user will quickly be producing sophisticated advertisments, designs, layouts, reports, presentations, and business correspondence. Hundreds of illustrations detail just how to construct impressive graphics. Shortcuts, tips, ond odvanced features are also documented to make the Macintosh even more productive. Includes o gallery of professional artists' Macintosh creations.

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Mindbusters

Ned W. Schultz

Here's a graphics puzzle game that is both challenging and unusually fascinating. The program was originally written for the Commodore 64, and we've added versions for the unexpanded VIC-20, Atari, Apple II-series computers, IBM PC (color or monochrome), PCjr, and TI-99/4A.

Are you ready to pit your brain against the computer's? "Mindbusters" presents you with three graphics puzzles that are guaranteed to keep your mind's microprocessors and memory chips whirring for hours.

After you type, save, and run your copy of Mindbusters, you can choose to solve one of three puzzles: a mind bender, a mind bruiser, or a mind blower. Warm up with the mind bender—it's the easiest. When you're prepared to press your brain to its limits, you're ready for the mind blower.

Following your selection, the program constructs a puzzle and displays it at the upper-left corner of the screen. Your job is to match that puzzle in the workspace at the lower-right corner of the screen. What's more, you try to solve the puzzle in as little time as possible. A timer ticks away as you work. There's no limit to how much time you can take, but the timer lets you compare your progress to a previous performance, or against another player if you wish. Your fastest time during the current session will be displayed on the screen.

Each puzzle is composed of several horizontal rows of odd shapes. A tiny arrow to the right of the workspace points to the row you're currently working on. To work on different rows, you can move the arrow up and down with the I and M keys (use the up/down cursor keys on the IBM and TI, and be sure to press ALPHA LOCK on the TI). To move the row of shapes next to the arrow left or right, press the J or K key (left/right cursor keys on the IBM and TI). When you think you've matched a row to the puzzle pattern, start working on another row.

When you succeed in correctly matching all the rows, the program automatically signals that you've solved the puzzle. Then you can play again if you like.

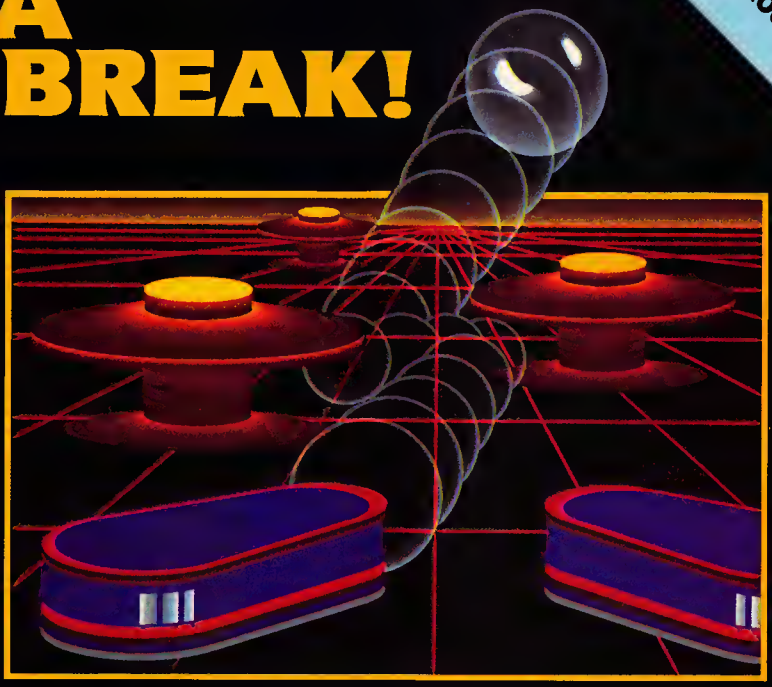
Helpful Hints

Because Mindbusters can generate a tremendous number of different puzzles, there are very few tricks to mastering it. I suggest you work from top to bottom or vice versa. The best tip I can offer after hours of my own mindbusting is to concentrate, concentrate, concentrate.

Important: When typing in the program, be extra careful with the long strings of characters at the beginning of the listing. These strings become the puzzle shapes. If you mistype or transpose a couple of characters when typing these strings, the program may still run, but it won't know when you've solved the puzzle. If you're using COMPUTE!'s "Automatic Proofreader" to enter the listing, remember that the Proofreader (except the IBM version) does not catch character-transposition errors.

TAKE A BREAK!

For Apple, Atari®, & Commodore 64™



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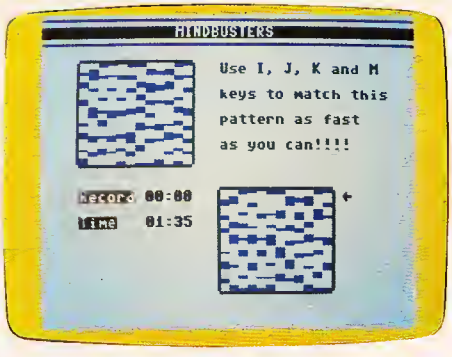
Program 1: Mindbusters For Commodore 64

Please refer to "COMPUTE!'s Guide To Typing In Programs" before entering this listing.

```
10 S=54272:R$="000000":FORI=1TO4:READKE(I
   ):NEXT                              :rem 238
20 PRINTCHR$(14)CHR$(8)                :rem 48
30 A$="XVAWVBWWAXNAWVBWWAXAWVBWANANAVVWAN
   NNXAWVWAXWAXCVNVNWAWVBNWCCXVNVAWNW"
                                       :rem 57
40 TM$="":FORI=1TO68:TM=ASC(MID$(A$,I,1))
   +97:TM$=TM$+CHR$(TM):NEXT:A$=TM$
                                       :rem 45
50 B$="12*0Z*Z*,0<2Z/*/00,Z/02ZZ2Z*1,<Z-2
   1,-2*Z<0Z-210*,Z*Z*1<122Z<Z1*<Z,*Z"
                                       :rem 167
60 TM$="":FORI=1TO68:TM=ASC(MID$(B$,I,1))
   +129:TM$=TM$+CHR$(TM):NEXT:B$=TM$
                                       :rem 93
70 C$="ZZ$$$ZZ$$$Z$Z$Z$Z$ZZZZZ$Z$$$Z$$$Z$Z
   $$$$Z$Z$ZZZZ$Z$Z$$$Z$ZZZZZ$Z$$Z$Z"
                                       :rem 11
80 TM$="":FORI=1TO68:TM=ASC(MID$(C$,I,1))
   +133:TM$=TM$+CHR$(TM):NEXT:C$=TM$
                                       :rem 92
90 POKE53281,1:PRINT"{CLR}{PUR}**********
   ****************************";
                                       :rem 109
100 PRINT"{4}{RVS}{14 SPACES}MINDBUSTERS
   {15 SPACES}{OFF}";                  :rem 168
110 PRINT"{PUR}**************************
   ************":GOSUB460:POKE53280,7
                                       :rem 33
120 PRINT"{HOME}{3 DOWN}{4 RIGHT}{4}
   {12 P}":PRINT"{3 RIGHT}{N}"SPC(12)"
   {H}{2 RIGHT}USE I, J, K AND M"
                                       :rem 132
130 PRINT"{3 RIGHT}{N}"SPC(12)"{H}":PRINT
   "{3 RIGHT}{N}"SPC(12)"{H}{2 RIGHT}KEY
   S TO MATCH THIS"                    :rem 84
140 PRINT"{3 RIGHT}{N}"SPC(12)"{H}":PRINT
   "{3 RIGHT}{N}"SPC(12)"{H}{2 RIGHT}PAT
   TERN AS FAST"                       :rem 177
150 PRINT"{3 RIGHT}{N}"SPC(12)"{H}":PRINT
   "{3 RIGHT}{N}"SPC(12)"{H}{2 RIGHT}AS
   {SPACE}YOU CAN!!!!"                 :rem 185
160 PRINT"{3 RIGHT}{N}"SPC(12)"{H}":PRINT
   "{4 RIGHT}{12 Y}"                   :rem 14
170 POKE214,3:PRINT                    :rem 132
180 FORN=1TO8:PP(N)=INT(RND(1)*56)+1:PRIN
   T"{4 RIGHT}"CHR$(Z)MID$(D$,PP(N),12)
                                       :rem 60
190 NEXT:PRINT:PRINTTAB(19)"{BLK}{12 P}"
                                       :rem 1
200 FORN=1TO8:PRINTTAB(18)"{N}"SPC(12)"
   {H}":NEXT:PRINTTAB(19)"{12 Y}"
                                       :rem 146
210 POKE214,13:PRINT                   :rem 176
220 FORN=1TO8:P(N)=INT(RND(1)*56)+1:PRINT
   TAB(19)CHR$(Z)MID$(D$,P(N),12):NEXT
                                       :rem 234
230 AL=1616:POKEAL,31:POKEAL+S,0:AC=1:TI$
   ="000000"                           :rem 75
240 POKE198,0:KE=PEEK(197):J=0:FORI=1TO4:
   IFKE=KE(I)THENJ=I:I=4               :rem 52
250 NEXT:ONJGOTO280,320,300,340        :rem 13
260 POKE214,13:PRINT:PRINT"{4 RIGHT}{RED}
   {RVS}RECORD{OFF}{RIGHT}{BLK}"MID$(R$,
   3,2)+":"+MID$(R$,5,2)               :rem 186
270 PRINT"{DOWN}{4 RIGHT}{RVS}TIME{OFF}
   {3 RIGHT}"MID$(TI$,3,2)":"MID$(TI$,5,
   2):GOTO240                          :rem 188
```



"Mindbusters" on the Commodore 64.

```
280 POKEAL,32:AL=AL-40:AC=AC-1:IFAL<1616T
   HENAL=1616:AC=1                     :rem 57
290 POKEAL,31:POKEAL+S,0:GOTO240       :rem 192
300 POKEAL,32:AL=AL+40:AC=AC+1:IFAL>1896T
   HENAL=1896:AC=8                     :rem 75
310 GOTO290                            :rem 104
320 POKE214,12+AC:PRINT:P(AC)=P(AC)-1:IFP
   (AC)<1THENP(AC)=1                   :rem 156
330 GOTO350                            :rem 103
340 POKE214,12+AC:PRINT:P(AC)=P(AC)+1:IFP
   (AC)>56THENP(AC)=56                 :rem 18
350 PRINTTAB(19)CHR$(Z)MID$(D$,P(AC),12)
                                       :rem 250
360 FORX=1TO8:IFPP(X)<>P(X)THEN240
                                       :rem 107
370 NEXT:SC$=TI$                       :rem 203
380 POKE214,15:PRINT:PRINT"{4 RIGHT}{BLK}
   {RVS}TIME{OFF}{3 RIGHT}"MID$(SC$,3,2)
   +":"+MID$(SC$,5,2)                  :rem 213
390 PRINT"{DOWN}{3 RIGHT}{PUR}PUZZLE SOLV
   ED!":GOSUB570:PRINT"{DOWN}{BLK}
   {4 RIGHT}PLAY AGAIN?"               :rem 148
400 PRINTSPC(7)"{DOWN}{RVS}Y{OFF}/{RVS}N
   {OFF}"                              :rem 2
410 POKE53280,4:GETK$:IFK$=""THENPOKE5328
   0,3:GOTO410                         :rem 47
420 IFK$="N"THENSYS2048                :rem 95
430 IFR$="000000"ORSC$<R$THENR$=SC$
                                       :rem 230
440 IFK$="Y"THEN90                     :rem 8
450 GOTO410                            :rem 103
460 PRINTSPC(10)"{3 DOWN}{BLK}DO YOU WANT
    TO:":PRINTSPC(11)"{DOWN}{RVS}1{OFF}
   {SPACE}BEND YOUR MIND?"             :rem 198
470 PRINTSPC(11)"{DOWN}{RVS}2{OFF} BRUISE
    YOUR MIND?"                        :rem 236
480 PRINTSPC(11)"{DOWN}{RVS}3{OFF} BLOW Y
   OUR MIND?"                          :rem 88
490 POKE53280,3:GETK$:IFK$=""THENPOKE5328
   0,4:GOTO490                         :rem 63
500 K=VAL(K$):IFK<1ORK>3THEN490        :rem 106
510 IFK=1THEND$=A$:Z=31:GOTO540        :rem 88
520 IFK=2THEND$=B$:Z=28:GOTO540        :rem 97
530 D$=C$:Z=144                        :rem 14
540 PRINT"{HOME}{3 DOWN}":FORN=1TO10:PRIN
   T"{39 SPACES}":NEXT                 :rem 21
550 RETURN                             :rem 122
560 DATA 33,37,36,34                   :rem 217
```

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```
570 FORI=STOS+24:POKEI,0:NEXT:POKES+24,15
    :POKES+5,48:POKES+6,48          :rem 178
580 POKES+4,33:FORI=20TO80STEP3:POKES+1,I
    :FORJ=1TO50:NEXT:NEXT:POKES+4,32
                                    :rem 159
590 POKES+24,0:RETURN               :rem 39
```

Program 2: Mindbusters For VIC-20

Please refer to "COMPUTE!'s Guide To Typing In Programs" before entering this listing.

```
10 S=30720:R$="000000":FORJ=1TO4:READKE(J
   ):NEXT:PRINTCHR$(14)CHR$(8)      :rem 240
20 A$="XVAWVBWWAXNAWVBWWAXAWVBWANANAVVWAN
   NNXAWVWAXWAXCVNVNWAWVBNWCCXVNVAWNW"
                                    :rem 56
30 TM$="":FORI=1TO68:TM=ASC(MID$(A$,I,1))
   +97:TM$=TM$+CHR$(TM):NEXT:A$=TM$
                                    :rem 44
40 B$="12*0Z*Z*,0<2Z/*/00,Z/02ZZ2Z*1,<Z-2
   1,-2*Z<0Z-210*,Z*Z*1<122Z<Z1*<Z,*Z"
                                    :rem 166
50 TM$="":FORI=1TO68:TM=ASC(MID$(B$,I,1))
   +129:TM$=TM$+CHR$(TM):NEXT:B$=TM$
                                    :rem 92
60 C$="ZZ$$$ZZ$$Z$Z$Z$Z$ZZZZZ$Z$$$Z$$$Z$Z
   $$$$Z$Z$ZZZZ$Z$Z$$$Z$ZZZZZZ$$$Z$$Z$"
                                    :rem 10
70 TM$="":FORI=1TO68:TM=ASC(MID$(C$,I,1))
   +133:TM$=TM$+CHR$(TM):NEXT:C$=TM$
                                    :rem 91
80 POKE36879,31:PRINT"{CLR}{PUR}*********
   **************";                :rem 45
90 PRINT"{BLK}{RVS}{5 SPACES}MINDBUSTERS
   {6 SPACES}{OFF}";                :rem 121
100 PRINT"{PUR}********************":GO
    SUB530                          :rem 208
110 PRINT"{HOME}{3 DOWN}{RIGHT}£4§£12 P§
    {3 SPACES}USE":PRINT"£N§"SPC(12)"£H§"
                                    :rem 69
120 PRINT"£N§"SPC(12)"£H§I,J,K,M":PRINT"
    £N§"SPC(12)"£H§"                :rem 150
130 PRINT"£N§"SPC(12)"£H§KEYS TO":PRINT"
    £N§"SPC(12)"£H§"                :rem 199
140 PRINT"£N§"SPC(12)"£H§ MATCH":PRINT"
    £N§"SPC(12)"£H§"                :rem 86
150 PRINT"£N§"SPC(12)"£H§GRID #1":PRINT"
    {RIGHT}£12 Y§"                  :rem 217
160 POKE214,3:PRINT                 :rem 131
170 FORN=1TO8:PP(N)=INT(RND(1)*56)+1:PRIN
    T"{RIGHT}"CHR$(Z)MID$(D$,PP(N),12)
                                    :rem 228
180 NEXT:PRINT:PRINT" {BLK}£12 P§
    {2 SPACES}WITH"                 :rem 170
190 PRINT"£N§"SPC(12)"£H§":PRINT"£N§"SPC(
    12)"£H§ #2 AS"                  :rem 215
200 PRINT"£N§"SPC(12)"£H§":PRINT"£N§"SPC(
    12)"£H§FAST AS"                 :rem 168
210 PRINT"£N§"SPC(12)"£H§":PRINT"£N§"SPC(
    12)"£H§YOU CAN"                 :rem 182
220 PRINT"£N§"SPC(12)"£H§"          :rem 161
230 PRINT"£N§"SPC(12)"£H§{2 SPACES}!!!":P
    RINT"{RIGHT}£12 Y§";            :rem 252
240 POKE214,13:PRINT                :rem 179
250 FORN=1TO8:P(N)=INT(RND(1)*56)+1:PRINT
    "{RIGHT}"CHR$(Z)MID$(D$,P(N),12):NEXT
                                    :rem 188
260 FORI=1TO4000:NEXT:PRINT"{HOME}
    {3 DOWN}";:FORI=1TO18:PRINTSPC(14)"
    {7 SPACES}":NEXT                :rem 166
270 PRINTSPC(14)"{7 SPACES}";:AL=8002:POK
    EAL,31:POKEAL+S,0:AC=1:TI$="000000"
                                    :rem 45
280 POKE198,0:KE=PEEK(197):J=0:FORI=1TO4:
    IFKE=KE(I)THENJ=I:I=4           :rem 56
290 NEXT:ONJGOTO340,360,380,400     :rem 23
300 POKE214,3:PRINT:PRINTSPC(16)"{RED}
    {RVS}BEST{OFF}:"                :rem 208
310 PRINT"{BLK}":PRINTSPC(16)MID$(R$,3,2)
    +":"+MID$(R$,5,2)               :rem 52
320 POKE214,8:PRINT:PRINTSPC(16)"{RVS}TIM
    E{OFF}:"                        :rem 188
330 PRINT"{DOWN}"SPC(16)MID$(TI$,3,2)":"M
    ID$(TI$,5,2):GOTO280            :rem 61
340 POKEAL,32:AL=AL-22:AC=AC-1:IFAL<8002T
    HENAL=8002:AC=1                 :rem 46
350 POKEAL,31:POKEAL+S,0:GOTO280    :rem 193
360 POKEAL,32:AL=AL+22:AC=AC+1:IFAL>8156T
    HENAL=8156:AC=8                 :rem 73
370 GOTO350                         :rem 107
380 POKE214,12+AC:PRINT:P(AC)=P(AC)-1:IFP
    (AC)<1THENP(AC)=1               :rem 162
390 GOTO410                         :rem 106
400 POKE214,12+AC:PRINT:P(AC)=P(AC)+1:IFP
    (AC)>56THENP(AC)=56             :rem 15
410 PRINT"{RIGHT}"CHR$(Z)MID$(D$,P(AC),12
    )                               :rem 198
420 FORX=1TO8:IFPP(X)<>P(X)THEN280
                                    :rem 108
430 NEXT:SC$=TI$                    :rem 200
440 POKE36878,15:FORI=1TO3:POKE36875,220:
    FORJ=1TO400:NEXT:POKE36875,0:POKE3687
    6,220                           :rem 223
450 FORJ=1TO400:NEXT:POKE36876,0:NEXT:POK
    E36878,0                        :rem 9
460 POKE214,13:PRINT:PRINTTAB(16)"{RED}YO
    U":PRINTTAB(15)"{DOWN}GOT IT"   :rem 27
470 PRINTTAB(17)"{DOWN}!!":PRINTTAB(15)"
    {DOWN}AGAIN":PRINTTAB(15)"{DOWN}(Y/N)
    ?";                             :rem 36
480 POKE36879,28:GETK$:IFK$=""THENPOKE368
    79,27:GOTO480                   :rem 199
490 IFK$="N"THENSYS1024             :rem 95
500 IFR$="000000"ORSC$<R$THENR$=SC$
                                    :rem 228
510 IFK$="Y"THEN80                  :rem 5
520 GOTO480                         :rem 108
530 PRINT"{2 DOWN}{BLK}{3 RIGHT}DO YOU WA
```

Here's how a mind-bending puzzle appears in the VIC version of "Mindbusters."

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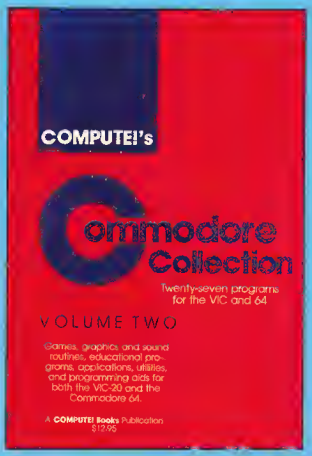

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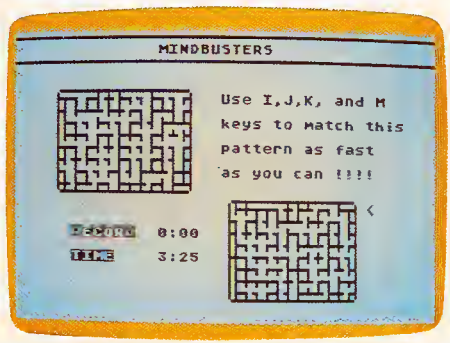
```
    NT TO:":PRINT"{2 DOWN}{RVS}{2 RIGHT}1
    {OFF} BEND YOUR MIND?"          :rem 36
540 PRINT"{2 RIGHT}{2 DOWN}{RVS}2{OFF} BR
    UISE YOUR MIND?"                :rem 156
550 PRINT"{2 RIGHT}{2 DOWN}{RVS}3{OFF} BL
    OW YOUR MIND?"                  :rem 8
560 POKE36879,27:GETK$:IFK$=""THENPOKE368
    79,28:GOTO560                   :rem 197
570 K=VAL(K$):IFK<1ORK>3THEN560     :rem 111
580 IFK=1THEND$=A$:Z=31:GOTO610     :rem 93
590 IFK=2THEND$=B$:Z=28:GOTO610     :rem 102
600 D$=C$:Z=144                     :rem 12
610 PRINT"{HOME}{3 DOWN}":FORN=1TO12:PRIN
    T"{21 SPACES}":NEXT:RETURN      :rem 47
620 DATA 12,36,44,20                :rem 204
```

Program 3: Mindbusters For Atari

Please refer to "COMPUTE!'s Guide To Typing In Programs" before entering this listing.

```
JP 1  GOTO 5
CJ 2  TIME=INT(PEEK(18)*65536+PEEK(19)
      *256+PEEK(20))/60:MIN=INT(TIME/6
      0):SEC=INT(TIME-MIN*60):RETURN
KB 5  DIM A$(68):DIM B$(68):DIM C$(68)
      :DIM D$(68):DIM P(8):DIM PP(8):D
      IM K(255):K(13)=1:K(1)=2:K(5)=3:
      K(37)=4
MD 6  DIM R$(5):DIM TI$(6):RECORD=0
JB 10 A$="IOKLNMNMOKILLNIOKNIOKLNMOMI
      LKNOIMKOINNNO1LKOKN1LKNOIMKNIML
      KMONLMOIKO"
HI 20 B$="DXASEOWASEODXASWWESAXOEAWSO
      DAXSODXASEWEWEODSAEEAEEODDAXXAS
      OEAXDOEXDX"
AF 30 C$="FFGGGFFGGFGFGFGFGFFFFFGFGGG
      FGGGFGFGGGGFGFGFFFFGFGFGGGFGFFF
      FFFGGFGGFG"
LL 40 FOR A=1 TO 68:A$(A,A)=CHR$(ASC(
      A$(A,A))-64):B$(A,A)=CHR$(ASC(B
      $(A,A))-64):C$(A,A)=CHR$(ASC(C$
      (A,A))-64):NEXT A
JP 50 POKE 752,1:GRAPHICS 17:PRINT #6
      ,"{CLEAR}"
PC 55 SETCOLOR 4,10,0
NN 60 POSITION 14,1:PRINT #6,"mindbus
      ters"
JF 70 POSITION 2,5:PRINT #6;"DO YOU WA
      NT TO:"
DP 80 POSITION 0,9:PRINT #6;"1. BEND
      YOUR MIND?"
BL 90 POSITION 0,11:PRINT #6;"2. BRUI
      SE YOUR MIND?"
IC 100 POSITION 0,13:PRINT #6;"3. BLO
       W YOUR MIND?":POKE 764,255
GE 110 KEY=PEEK(764):IF KEY=31 THEN D
       $=A$:GOTO 150
OO 120 IF KEY=30 THEN D$=B$:GOTO 150
PF 130 IF KEY=26 THEN D$=C$:GOTO 150
GA 140 GOTO 110
HL 150 GRAPHICS 0:POKE 752,1
LN 151 POKE 709,0:POKE 710,8:POKE 712
       ,52
EC 155 POSITION 0,0:PRINT "{40 R}":PO
       SITION 13,1:PRINT "MINDBUSTERS
       "
HF 160 POSITION 0,2:PRINT "{40 R}"
HC 180 FOR A=5 TO 12:POSITION 3,A:PRI
       NT "{B}{12 SPACES}{V}":POSITION
        19,A+9:PRINT "{B}{12 SPACES}
       {V}":NEXT A
ME 190 POSITION 4,4:PRINT "{12 N}":PO
       SITION 4,13:PRINT "{12 M}":POS
       ITION 20,13:PRINT "{12 N}"
NL 200 POSITION 20,22:PRINT "{12 M}";
NI 210 POSITION 19,5:PRINT "Use I,J,K
       , and M":POSITION 19,7:PRINT "
       keys to match this"
GD 220 POSITION 19,9:PRINT "pattern a
       s fast"
DG 230 POSITION 19,11:PRINT "as you c
       an !!!!":POSITION 2,5
JI 240 FOR N=1 TO 8:PP(N)=INT(RND(1)*
       56)+1:PRINT "{2 RIGHT}";D$(PP(
       N),PP(N)+11):NEXT N
AG 250 FOR N=1 TO 8:P(N)=INT(RND(1)*5
       6)+1:POSITION 20,13+N:PRINT D$
       (P(N),P(N)+11):NEXT N
JI 260 AX=33:AY=14:AC=1:POSITION AX,A
       Y:PRINT "<":FOR A=18 TO 20:POK
       E A,0:NEXT A
HI 261 RM=INT(RECORD/60):RS=INT(RECOR
       D-RM*60)
NG 262 POSITION 13,16:PRINT RM;":";:I
       F RS<10 THEN PRINT "0";
MN 263 PRINT RS
BJ 270 KEY=K(PEEK(764)):POKE 764,255:
       ON KEY GOTO 300,400,350,450
KB 280 POSITION 5,16:PRINT "RECORD "
LP 290 POSITION 5,18:GOSUB 2:PRINT "T
       IME{4 SPACES}";MIN;":";:IF SEC
       <10 THEN PRINT "0";
JD 295 PRINT SEC;" ":GOTO 270
PD 300 POSITION AX,AY:AC=AC-1:PRINT "
        ":AY=AY-1:IF AY<14 THEN AY=14
       :AC=1
LL 310 POSITION AX,AY:PRINT "<":GOTO
       270
HN 350 POSITION 20,AY:P(AC)=P(AC)-1:I
       F P(AC)<1 THEN P(AC)=1:GOTO 27
       0
GH 360 GOTO 410
QB 400 POSITION 20,AY:P(AC)=P(AC)+1:I
       F P(AC)>56 THEN P(AC)=56
NO 410 PRINT D$(P(AC),P(AC)+11)
GL 420 FOR X=1 TO 8:IF PP(X)<>P(X) TH
       EN 270
CO 430 NEXT X
```



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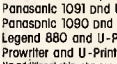

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```
MD 435 POSITION 4,20:PRINT "PUZZLE SO
      LVED!":GOSUB 590:POSITION 3,22
      :PRINT "Play again (y/n)";
KE 440 IF PEEK(764)=35 THEN GRAPHICS
      0:END
HN 445 IF RECORD=0 OR TIME<RECORD THE
      N RECORD=TIME
HN 447 IF PEEK(764)=43 THEN 50
HB 448 GOTO 440
PK 450 POSITION AX,AY:AC=AC+1:PRINT "
       ":AY=AY+1:IF AY>21 THEN AY=21
      :AC=B
MB 460 POSITION AX,AY:PRINT "<":GOTO
      270
GA 590 FOR A=100 TO 10 STEP -1:SOUND
      1,A,10,15:SOUND 2,A+50,10,15:P
      OKE 53274,A:NEXT A:SOUND 1,0,0
      ,0
EJ 600 SOUND 2,0,0,0:POKE 53274,0:RET
      URN
```

Program 4: Mindbusters For IBM PC/PCjr

Please refer to "COMPUTE!'s Guide To Typing In Programs" before entering this listing.

```
MJ 10 CLS:SCREEN 0,1:DEF SEG=0:POKE 1047,
      (PEEK(1047) OR 64) AND 223:HI=0:R$=
      " 0:00"
JD 20 WIDTH 40:KEY OFF:DEF SEG=&H40:RANDO
      MIZE PEEK(&H6D)
DK 30 FOR I=1 TO 4:READ KE(I):NEXT
CE 40 A$="AABBBAABBABABABABAAAAABABBBABBB
      ABABBBBABABAAAABABABBBABABAAAAABBABB
      AB"
GE 50 TM$="":FOR I=1 TO 6B:TM=ASC(MID$(A$
      ,I,1))+12B:TM$=TM$+CHR$(TM):NEXT:A$
      =TM$
CF 60 B$="DEAdEBddADeAdEBddADAdEBdAeAeAEE
      dAeeeDAdEdADdADCEeEedAdEBedCCDEeEAd
      ed"
KA 70 TM$="":FOR I=1 TO 6B:TM=ASC(MID$(B$
      ,I,1))+154:TM$=TM$+CHR$(TM):NEXT:B$
      =TM$
JN B0 C$="TUASWAWABSVUWRARSSBWRSUWWUWATBV
      WQUTBQUAWVSWQUTSABWAWATVTUUWVWTAVWB
      AW"
MC 90 TM$="":FOR I=1 TO 68:TM=ASC(MID$(C$
      ,I,1))+120:TM$=TM$+CHR$(TM):NEXT:C$
      =TM$
CP 100 COLOR 5:PRINT STRING$(40,220);:COL
      OR 3:LOCATE 2,15,0:PRINT"MINDBUSTE
      RS":COLOR 5:PRINT STRING$(40,223):
      GOSUB 380:COLOR ,0,14
PP 110 COLOR 7:LOCATE 4,4:PRINT STRING$(1
      2,220):PRINT TAB(3)CHR$(222)SPC(12
      )CHR$(221)SPC(4)"Use cursor keys t
      o"
DL 120 PRINT TAB(3)CHR$(222)SPC(12)CHR$(2
      21):PRINT TAB(3)CHR$(222)SPC(12)CH
      R$(221)SPC(4)"match this pattern"
IJ 130 PRINT TAB(3)CHR$(222)SPC(12)CHR$(2
      21):PRINT TAB(3)CHR$(222)SPC(12)CH
      R$(221)SPC(4)"as fast as you can":
      PRINT TAB(3)CHR$(222)SPC(12)CHR$(2
      21)
GE 140 PRINT TAB(3)CHR$(222)SPC(12)CHR$(2
      21)SPC(11)"!!!!":PRINT TAB(3)CHR$(
      222)SPC(12)CHR$(221):PRINT TAB(4)S
      TRING$(12,223)
PH 150 COLOR Z,0:FOR N=1 TO 8:PP(N)=INT(R
      ND(1)*56)+1:LOCATE 4+N,4:PRINT MID
      $(D$,PP(N),12):NEXT:COLOR 7,0:PRIN
      T
DH 160 PRINT TAB(23)STRING$(12,220):PRINT
       TAB(4);:COLOR 0,4:PRINT"Record";:
      COLOR 7,0:PRINT SPC(3)R$:LOCATE 15
      ,22:PRINT CHR$(222)SPC(12)CHR$(221
      )
IJ 170 PRINT TAB(22)CHR$(222)SPC(12)CHR$(
      221):PRINT TAB(4);:COLOR 0,2:PRINT
      "Time";:COLOR 7,0:PRINT SPC(14)CHR
      $(222)SPC(12)CHR$(221)
CF 180 FOR I=1 TO 5:PRINT TAB(22)CHR$(222
      )SPC(12)CHR$(221):NEXT I:PRINT TAB
      (23)STRING$(12,223)
LJ 190 COLOR Z,0:FOR N=1 TO B:P(N)=INT(RN
      D(1)*56)+1:LOCATE 14+N,23:PRINT MI
      D$(D$,P(N),12):NEXT:COLOR 7,0:PRIN
      T
JG 200 AC=1:LOCATE AC+14,37:PRINT CHR$(27
      ):POKE &H6D,0:POKE &H6C,0
KJ 210 COLOR 7,0:C=PEEK(&H6C):D=PEEK(&H6D
      ):T=(C+D*256)/1B.2:MT=INT(T/60):M$
      =STR$(MT):ST=INT((T/60-MT)*60):S$=
      STR$(ST):IF ST<10 THEN S$="0"+RIGH
      T$(STR$(ST),1)
EJ 220 LOCATE 17,13:PRINT M$":"RIGHT$(S$,
      2):K$=INKEY$:IF LEN(K$)<>2 THEN 21
      0
JA 230 J=0:FOR I=1 TO 4:IF ASC(MID$(K$,2,
      1))=KE(I) THEN J=I:I=4
FJ 240 NEXT:ON J GOTO 260,300,280,320
CM 250 GOTO 210
NJ 260 LOCATE AC+14,37:PRINT" ":AC=AC-1:I
      F AC<1 THEN AC=1
PJ 270 LOCATE AC+14,37:PRINT CHR$(27):GOT
      O 210
FF 280 LOCATE AC+14,37:PRINT " ":AC=AC+1:
      IF AC>B THEN AC=B
GG 290 GOTO 270
MF 300 P(AC)=P(AC)-1:IF P(AC)<1 THEN P(AC
      )=1
DF 310 GOTO 330
DJ 320 P(AC)=P(AC)+1:IF P(AC)>56 THEN P(A
      C)=56
FI 330 LOCATE AC+14,23:COLOR Z,0:PRINT MI
      D$(D$,P(AC),12)
CC 340 FOR X=1 TO B:IF PP(X)<>P(X) THEN 2
      10
```

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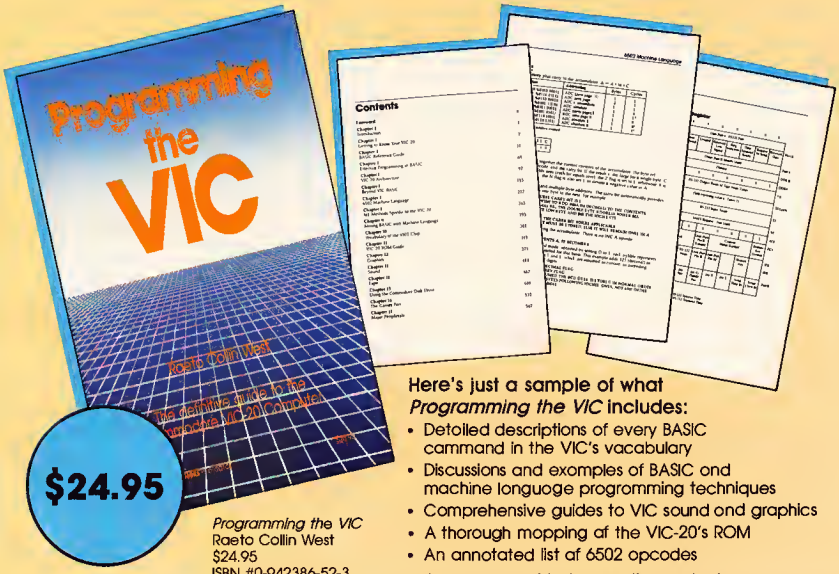

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```
IP 350 NEXT:COLOR 14,0:LOCATE 20,4:PRINT"
       Puzzle solved!":GOSUB 450:LOCATE 2
       2,5:PRINT"Play again?":LOCATE 23,7
       :PRINT"(Y/N)"
LH 360 IF INT(T)<HI OR HI=0 THEN HI=INT(T
       ):R$=RIGHT$(M$,2)+":"+RIGHT$(S$,2)
HN 370 COLOR ,0,3:K$=INKEY$:IF K$="" THEN
        COLOR ,0,5:GOTO 370 ELSE IF K$="N
       " THEN END ELSE IF K$="Y" THEN CLS
       :GOTO 100 ELSE 370
KJ 380 LOCATE 9,13:COLOR 5,0:PRINT "Do yo
       u want to:":LOCATE 11,13:COLOR 0,5
       :PRINT"1";:COLOR 5,0:PRINT" Send y
       our mind?"
MD 390 LOCATE 13,13:COLOR 0,5:PRINT"2";:C
       OLOR 5,0:PRINT" Bruise your mind?"
       :LOCATE 15,13:COLOR 0,5:PRINT "3";
       :COLOR 5,0:PRINT " Blow your mind?
       "
DN 400 COLOR ,0,3:K$=INKEY$:IF K$="" THEN
        COLOR ,0,5:GOTO 400 ELSE K=VAL(K$
       ):IF K<1 OR K>3 THEN 400
LD 410 IF K=1 THEN D$=A$:Z=2:GOTO 430
JD 420 IF K=2 THEN D$=B$:Z=4 ELSE D$=C$:Z
       =3
AA 430 FOR I=0 TO 9:LOCATE 9+I,13:PRINT S
       TRING$(19,32):NEXT:RETURN
MI 440 DATA 72,77,80,75
LD 450 FOR I=220 TO 880 STEP 20:SOUND I,.
       5:NEXT:RETURN
```

Program 5: Mindbusters For Apple

```
10  HIMEM: 36096
20 R1 = 0:R2 = 0:H$ = "
                "
30  GOSUB 620
40 A$ = "'%!&%4&&!'$!&%4&&!'!&%4&!$!$!%
   %&!$$$'!&%&!'&!'#%$%$&!&%4$&&##'%$%
   !&$&"
50 B$ = "/0(.+(+(*.)0+-(-..*+-.0++0+(/*
   )++0/*+0(+).++0/.(*+(+(/)/00+)+/()
   +*(+"
60 C$ = "1122211221212121211112212221222
   2121222212121111212122221211111221
   2212"
70  TEXT : HOME : VTAB 5: PRINT "     ";
    : FOR I = 4 TO 35: PRINT  CHR$ (95
   );: NEXT : PRINT
80  PRINT : PRINT  SPC( 14)"MINDBUSTERS
   "

90  PRINT "    ";; FOR I = 4 TO 35: PRINT
     CHR$ (95);: NEXT : PRINT : VTAB 1
    1: PRINT  TAB( 15)"PLEASE WAIT..."
    : GOSUB 440
100  HGR : HCOLOR= 5: HPLOT 1,3 TO 95,3
     TO 95,75 TO 1,75 TO 1,3
110  HCOLOR= 6: HPLOT 154,76 TO 250,76 TO
     250,147 TO 154,147 TO 154,76
120  POKE 6,0: POKE 7,141: POKE 54,0: POKE
     55,3: CALL 1002
130  FOR N = 1 TO 8:PP(N) =  INT ( RND
     (3) * 55) + 1: HTAB 2: VTAB 1 + N:
     PRINT  MID$ (D$,PP(N),12): NEXT
140  FOR N = 1 TO 8:P(N) =  INT ( RND (
     2) * 55) + 1: VTAB 10 + N: HTAB 24
    : PRINT  MID$ (D$,P(N),12): NEXT
150  VTAB 11: HTAB 38: PRINT "3"
160 AC = 1: VTAB 21: PRINT  TAB( 14)"US
    E THE I, J, K AND M": PRINT  TAB(
    14)"KEYS TO MATCH THE PATTERN": PRINT
     TAB( 14)"IN THE RED BOX AS FAST":
     PRINT  TAB( 14)"AS YOU CAN!!!";
170 KE =  PEEK ( - 16384):J = 0: POKE  -
    16368,0:J = KE - 200
180 T3 = T3 + 1: IF T3 = 12 THEN T3 = 0
    :T2 = T2 + 1: IF T2 = 60 THEN T2 =
    00:T1 = T1 + 1
190  IF J < 0 OR J > 5 THEN J = 0
200  ON J GOTO 240,320,300,170,270
210  HTAB 1: VTAB 22: PRINT "RECORD "R1
    ":";: IF R2 < 10 THEN  PRINT "0";
220  PRINT R2: HTAB 1: VTAB 24: PRINT "
    TIME "T1":";: IF T2 < 10 THEN  PRINT
    "0";
230  PRINT T2;: GOTO 170
240  VTAB 10 + AC: HTAB 38: PRINT " "
250 AC = AC - 1: IF AC < 1 THEN AC = 1
260  VTAB 10 + AC: HTAB 38: PRINT "3";:
     GOTO 210
270 AC = AC + 1: IF AC > 8 THEN AC = 8
280  VTAB 9 + AC: HTAB 38: PRINT " "
290  GOTO 260
300 P(AC) = P(AC) - 1: IF P(AC) < 1 THEN
    P(AC) = 1
310  GOTO 330
320 P(AC) = P(AC) + 1: IF P(AC) > 56 THEN
    P(AC) = 56
330  VTAB 10 + AC: HTAB 24: PRINT  MID$
    (D$,P(AC),12)
340  FOR X = 1 TO 8: IF PP(X) <  > P(X)
     THEN 210
350  NEXT
360  FOR I = 21 TO 23: VTAB I: HTAB 14:
     PRINT H$: NEXT : VTAB 24: HTAB 14
    : PRINT  MID$ (H$,1,14);: FOR I =
    1 TO 5: PRINT  CHR$ (7);: NEXT
370  VTAB 22: HTAB 20: PRINT "PUZZLE SO
    LVED!": HTAB 20: PRINT "PLAY AGAIN
    ?"
380  HTAB 26: PRINT "Y/N";: GET K$
390  IF K$ = "N" THEN  TEXT : HOME : END

400 T$ =  STR$ (T1) + "." +  STR$ (T2):
    R$ =  STR$ (R1) + "." +  STR$ (R2)

410  IF R$ = "0.0" OR  VAL (T$) <  VAL
    (R$) THEN R1 = T1:R2 = T2
420  IF K$ = "Y" THEN T1 = 0:T2 = 0:T3 =
    0: GOTO 70
430  GOTO 380
440  POKE 230,32: CALL  - 3086: POKE 23
    0,64: CALL  - 3086
450  POKE 54,240: POKE 55,253: CALL 100
    2
460  FOR P = 1 TO 2: HCOLOR= P: FOR I =
    1 TO 8
470  HPLOT I,I TO 279 - I,I TO 279 - I,
    191 - I TO I,191 - I TO I,I
480  NEXT I: POKE 230,32: NEXT P
490  VTAB 11: HTAB 26: PRINT "   "
500  VTAB 11: HTAB 11: PRINT "DO YOU WA
    NT TO:": PRINT : PRINT  TAB( 11)"1
     - BEND YOUR MIND?": PRINT : PRINT
     TAB( 11)"2 - BRUISE YOUR MIND?": PRINT
    : PRINT  TAB( 11)"3 - BLOW YOUR MI
    ND?"
510  POKE  - 16302,0
520 A =  PEEK ( - 16384): IF A > 127 THEN
    550
530  POKE  - 16297,0: POKE  - 16304,0: POKE
     - 16300,0: POKE  - 16299,0: POKE
```

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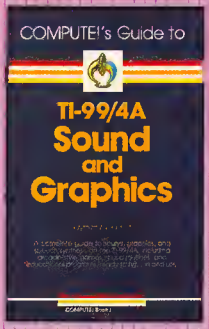

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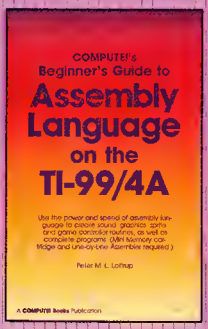

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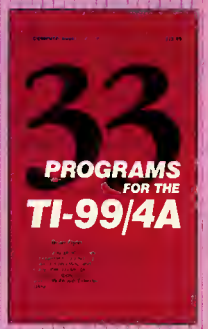

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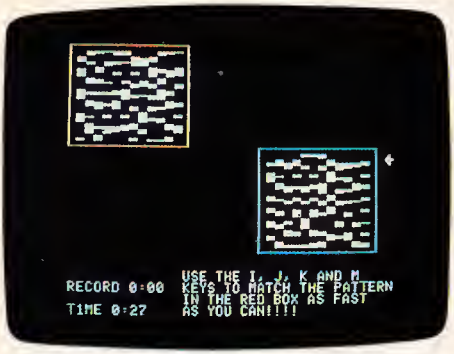


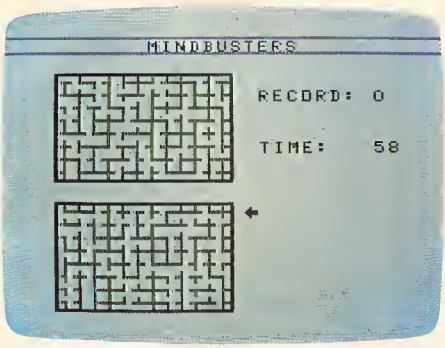
Apple "Mindbusters."

```
      - 16300,0: POKE  - 16303,0: FOR 1
      = 1 TO 50: NEXT
540   GOTO 520
550   POKE  - 16368,0:A = A - 176: IF A <
      1 OR A > 3 THEN 520
560   POKE 230,32: CALL  - 3086
570   IF A = 1 THEN D$ = A$
580   IF A = 2 THEN D$ = B$
590   IF A = 3 THEN D$ = C$
600   RETURN
610   REM  SHAPE DATA
620   FOR 1 = 36096 TO 36263: READ A:CS =
      CS + A: POKE 1,A: NEXT
630   IF CS <  > 11534 THEN  PRINT "ERRO
      R IN FIRST SET OF DATA STATEMENTS.
      ": STOP
640   DATA  128,128,128,128,128,128,128,
      128
650   DATA    0,0,0,0,255,255,255,255
660   DATA  0,0,0,0,0,0,0,0
670   DATA  0,0,0,0,0,0,0,255
680   DATA  0,0,0,0,0,0,255,255
690   DATA  255,255,0,0,0,0,0,0
700   DATA  255,255,255,0,0,0,0,0
710   DATA  0,0,0,0,0,255,255,255
720   DATA  24,24,24,31,31,24,24,24
730   DATA  24,24,24,31,31,0,0,0
740   DATA  0,0,0,248,248,24,24,24
750   DATA  0,0,0,31,31,24,24,24
760   DATA  24,24,24,255,255,0,0,0
770   DATA  0,0,0,255,255,24,24,24
780   DATA  24,24,24,248,248,24,24,24
790   DATA  24,24,24,248,248,0,0,0
800   DATA  24,24,24,255,255,24,24,24
810   DATA  204,153,51,102,204,153,51,10
      2
820   DATA  51,153,204,102,51,153,204,10
      2
830   DATA  8,12,14,127,127,14,12,8
840   DATA   255,0,0,0,0,0,0,0
850   REM  HROUT ML ROUTINE
860   FOR 1 = 768 TO 856: READ A:CK = CK
       + A: POKE 1,A: NEXT
870   IF CK <  > 8413 THEN  PRINT "ERROR
       IN SECOND SET OF DATA STATEMENTS.
      ": STOP
880   RETURN
890   DATA  216,120,133,69,134,70,132,71

900   DATA  166,7,10,10,176,4,16,62
910   DATA  48,4,16,1,232,232,10,134
920   DATA  27,24,101,6,133,26,144,2
930   DATA  230,27,165,40,133,8,165,41
940   DATA  41,3,5,230,133,9,162,8
950   DATA  160,0,177,26,36,50,48,2
960   DATA  73,127,164,36,145,8,230,26
970   DATA  208,2,230,27,165,9,24,105
980   DATA  4,133,9,202,208,226,165,69
990   DATA  166,70,164,71,88,76,240,253
1000  DATA  255,255,255,255,255,255,255
      ,255
```

Program 6: Mindbusters For TI-99/4A

```
100   GOTO 150
110   FOR M=1 TO LEN(H$)
120   CALL HCHAR(R,C+M,ASC(SEG$(H$,M,
      1)))
130   NEXT M
140   RETURN
150   CALL CLEAR
160   SCR=3
170   HIGH=0
180   GOSUB 1470
190   CALL SCREEN(15)
200   FOR I=9 TO 12
210   CALL COLOR(I,1,1)
220   NEXT I
230   GOSUB 1730
240   GOSUB 1760
250   GOSUB 1730
260   PRINT
270   FOR J=1 TO 2
280   PRINT "  "&CHR$(135)&CHR$(129)&
      CHR$(129)&CHR$(129)&CHR$(129)&C
      HR$(129)&CHR$(129)&CHR$(129)&CH
      R$(129);
290   PRINT CHR$(129)&CHR$(129)&CHR$(
      129)&CHR$(129)&CHR$(132)
300   FOR I=1 TO 8
310   PRINT "  "&CHR$(130)&"
      (12 SPACES)"&CHR$(134)
320   NEXT I
330   PRINT "  "&CHR$(131)&CHR$(128)&
      CHR$(128)&CHR$(128)&CHR$(128)&C
      HR$(128)&CHR$(128)&CHR$(128)&CH
      R$(128);
340   PRINT CHR$(128)&CHR$(128)&CHR$(
      128)&CHR$(128)&CHR$(133)
350   NEXT J
360   CALL HCHAR(1,1,136,32)
370   CALL HCHAR(3,1,137,32)
380   H$="USE ARROW"
390   R=7
400   C=19
410   GOSUB 110
420   H$="KEYS TO"
430   R=9
440   GOSUB 110
450   R=11
460   H$="MATCH THE"
470   GOSUB 110
480   R=13
490   H$="1ST GRID"
500   GOSUB 110
510   H$="WITH THE 2ND"
520   R=15
```



"Mindbusters" on the TI-99/4A.

```
530 GOSUB 110
540 H$="AS FAST AS"
550 R=17
560 GOSUB 110
570 H$="YOU CAN !!!"
580 R=19
590 GOSUB 110
600 R=5
610 C=5
620 FOR N=1 TO 8
630 RANDOMIZE
640 PP(N)=INT(RND*56)+1
650 H$=SEG$(D$,PP(N),12)
660 GOSUB 110
670 R=R+1
680 NEXT N
690 R=R+2
700 FOR N=1 TO 8
710 RANDOMIZE
720 P(N)=INT(RND*56)+1
730 H$=SEG$(D$,P(N),12)
740 GOSUB 110
750 R=R+1
760 NEXT N
770 CALL SOUND(100,440,3)
780 CALL COLOR(KSET(Z),F(Z),1)
790 IF Z<>2 THEN 810
800 CALL COLOR(11,13,1)
810 FOR R=5 TO 20
820 CALL HCHAR(R,20,32,12)
830 NEXT R
840 TIME=0
850 R1=15
860 C1=19
870 CALL HCHAR(R1,C1,91)
880 H$="RECORD: "&STR$(HIGH)
890 R=6
900 C=19
910 GOSUB 110
920 H$="TIME:{3 SPACES}"&STR$(TIME)
930 R=10
940 GOSUB 110
950 CALL KEY(0,K,S)
960 TIME=TIME+.3
970 H$=STR$(INT(TIME))
980 C=27
990 R=10
1000 GOSUB 110
1010 IF (K<>69)*(K<>88)THEN 1070
1020 CALL HCHAR(R1,C1,32)
1030 R1=R1-(R1<>15)*(K=69)+(R1<>22)
     *(K=88)
1040 CALL HCHAR(R1,C1,91)
1050 TIME=TIME+.1
1060 GOTO 950
1070 IF K<>68 THEN 1100
1080 P(R1-14)=P(R1-14)+(P(R1-14)<>1
     )
1090 GOTO 1120
1100 IF K<>83 THEN 950
1110 P(R1-14)=P(R1-14)-(P(R1-14)<>5
     6)
1120 H$=SEG$(D$,P(R1-14),12)
1130 R=R1
1140 C=5
1150 GOSUB 110
1160 TIME=TIME+1
1170 FOR X=1 TO 8
1180 IF PP(X)<>P(X)THEN 950
1190 NEXT X
1200 H$="PUZZLE"
1210 R=16
1220 C=22
1230 GOSUB 110
1240 H$="SOLVED!"
1250 FOR I=220 TO 880 STEP 20
1260 CALL SOUND(50,I,3)
1270 NEXT I
1280 R=18
1290 GOSUB 110
1300 H$="PLAY"
1310 R=20
1320 C=23
1330 GOSUB 110
1340 H$="AGAIN (Y/N)?"
1350 C=20
1360 R=22
1370 GOSUB 110
1380 CALL KEY(0,K,S)
1390 IF S=0 THEN 1380
1400 IF K=89 THEN 1430
1410 IF K<>78 THEN 1380
1420 STOP
1430 IF (INT(TIME)>HIGH)*(HIGH<>0)T
     HEN 1450
1440 HIGH=INT(TIME)
1450 CALL CLEAR
1460 GOTO 190
1470 FOR I=1 TO 29
1480 READ A,A$
1490 CALL CHAR(A,A$)
1500 NEXT I
1510 CALL COLOR(14,14,1)
1520 A$="geafebffagdafebffagafebfad
     adaeefadddgafefagfagcededfafeb
     dfccgedeafdf"
1530 B$="mnhlphphilonpkhkllipklnppn
     phmiopjnmijnhpolpjnmlhiphphmom
     nnpopmhopihp"
1540 C$="yyxxxyyxxyxyxyxyyyyyxyxx
     xyxxxyxyxxxxyxyxyyyyxyxyxxxyy
     yyyyxxyxxyx"
1550 F(1)=5
1560 KSET(1)=9
1570 F(2)=13
1580 KSET(2)=10
1590 F(3)=2
1600 KSET(3)=12
1610 RETURN
```

```
1620 DATA 97,00000000FFFFFFFF,98,FF
     00000000000000,99,0000000000000
     00FF
1630 DATA 100,000000000000FFFF,101,
     FFFF0000000000000,102,FFFFFF000
     0000000
1640 DATA 103,000000000FFFFFF,104,
     1818181F1F181818,105,1818181F1
     F000000
1650 DATA 106,000000F8F8181818,107,
     000001F1F181818,108,181818FFF
     F000000
1660 DATA 109,00000FFFF181818,110,
     181818F8F8181818,111,181818F8F
     8000000
1670 DATA 112,181818FFFF181818,120,
     CC993366CC993366,121,3399CC663
     399CC66
1680 DATA 128,FFFF0000000000000,129,
     00000000000FFFF,130,0303030300
     3030303
1690 DATA 131,03030000000000000,132,
     00000000000C0C0,133,C0C0000000
     0000000
1700 DATA 134,C0C0C0C0C0C0C0C0,135,
     00000000000303,91,0010307FFF
     7F3010
1710 DATA 136,000000000000FFFF,137,
     FFFF0000000000000
1720 PRINT "  }{{{{{{{{{{{{{{"&CHR$(
     127)
1730 CALL CLEAR
1740 PRINT TAB(10);"MINDBUSTERS"
1750 RETURN
1760 PRINT : : : :
1770 PRINT TAB(7);"DO YOU WANT TO:"
     : : :
1780 PRINT TAB(6);"1 BEND YOUR MIND
     ?": :
1790 PRINT TAB(6);"2 BRUISE YOUR MI
     ND?": :
1800 PRINT TAB(6);"3 BLOW YOUR MIND
     ?": : : : : :
1810 CALL HCHAR(5,1,136,32)
1820 CALL HCHAR(7,1,137,32)
1830 CALL KEY(0,K,S)
1840 CALL SCREEN(SCR)
1850 SCR=SCR-(SCR<16)+(SCR=16)*14
1860 IF S=0 THEN 1830
1870 CALL SCREEN(15)
1880 Z=K-48
1890 IF (Z<1)+(Z>3)THEN 1830
1900 IF Z>1 THEN 1930
1910 D$=A$
1920 RETURN
1930 IF Z=3 THEN 1960
1940 D$=B$
1950 RETURN
1960 D$=C$
1970 RETURN
```

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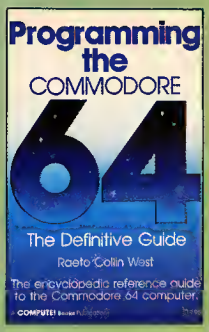

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Raeto Collin West

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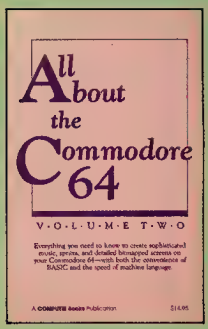

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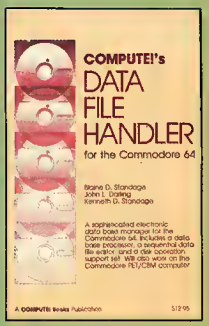

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Blaine D. Standage, John L. Darling, Kenneth D. Standage

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Mind Prober

Richard Mansfield, Senior Editor

System requirements: Commodore 64 and a disk drive; IBM PC with at least 128K RAM and a disk drive; Enhanced Model PCjr; Apple II-series computer with at least 48K RAM and a disk drive; Apple Macintosh; or Hewlett-Packard HP-110. Printer optional.

An ominous title screen from Mind Prober *(IBM version).*

There is an old trick used by fortune tellers, horoscope casters, psychics, and bad psychologists: symmetrical analysis. It works like this: You make an observation, then contradict it. For example, tell someone that they're generous, and yet careful with their money.

Most people will believe that they're generous *and* that they're careful, even though these character traits are in direct conflict. By balancing them against each other, however, you've been sufficiently complimentary and sufficiently vague that your observation is likely to be believed, likely even to be thought insightful.

Yet a truly meaningful character analysis must be specific. If it's not specific then it's *too* true, true of everyone, like horoscopes.

Specific And Accurate

Mind Prober, a new personality analysis program from Human Edge Software, succeeds surprisingly well; it's often specific and it's often accurate.

To use it, you type in the name of a person you want to analyze. It can be you, your boss, your best friend, anyone, but the better you know the subject, the more specific and accurate the analysis is likely to be. Then you tell the program whether or not the subject is over 18 and if it's a male or female.

The analysis begins. A series of some 60 adjectives starts appearing onscreen. For each one, you must either agree or disagree that the word describes the subject. If you cannot decide, you can press the H key and see a fuller explanation.

Here's part of the list: rebellious, opinionated, sarcastic, aggressive, cynical, self-righteous, accomplishing, worrisome, sympathetic, emotional. In each case, you would type A for agree or D for disagree. If you asked for further help with, say, *accomplishing*, you'd see this fuller definition: able to bring a task to completion; achieving.

Some of the questions seem redundant, but perhaps that's a way of defining the degree of a given character trait. For example, you are asked *AGGRESSIVE?* and then later, *CAUTIOUS?* The entire quiz is reminiscent of psychological tests given in schools.

What Makes Him Tick?

When you've finished giving your answers, you can request a report. This consists of 13 paragraphs which purport to describe several facets of the subject's personality. The report is divided into seven sections: personality summary, relationships, attitudes toward work, coping with stress, personal interests, attitudes toward sex (or school, if the subject is under 18), and what makes the subject tick (general motivational factors).

A summary, for example, might say: *You're likely to find Mr. Don O'Connell behind the scenes in most situations. He is a quiet person, preferring to follow rather than lead. His general approach to life is no-nonsense, and he likes to stick to the facts. He is conscientious and detail-oriented.*

This description is typical of the detail and specificity of *Mind Prober* and the reason that it is an impressive piece of software. This summary would not, obviously, be true of everyone.

The software's documentation claims that the reports are based on "massive amounts of

information" in an "expert system" on the disk. Unfortunately, the program is copy-protected, so you can't examine its methods, its data, or store more than eight assessments at any given time, because the program stores its reports on the program disk. If you try to assess a ninth personality, you'll have to first remove one of the older reports. You can, however, direct reports to your printer for archiving.

The Thinker Type

Accompanying the program is a book which makes some rather elaborate claims for itself: Analyze anyone, find out the hidden truths, how to read others, how to get ahead in business, etc. The text is one of those uneasy pop-psychology musings wherein the obvious competes with the dubious. And what's not obvious or dubious is largely superficial. In describing how to tell a person's "type" by his or her gait, we are advised that "The Thinker" type holds their "heads and shoulders pointed toward the ground, indicating that they are preoccupied and do not wish to be disturbed. Typically, their hands are clasped behind their backs and their gait is slow and methodical." All this seems somewhat more plausible than phrenology, but only somewhat.

Nevertheless, the software itself is often startling in its accuracy. Oddly enough, the greatest source of error with *Mind Prober* appears to be when you answer questions about yourself. This would seem to violate the rule that the better you know someone, the better the analysis. But perhaps it merely points up the fundamental quality of the program's database and set of equations—self-analysis is very difficult. It also serves to distinguish *Mind Prober* from those little personality quizzes found in some magazines.

While it seems unlikely that *Mind Prober* will make your dreams come true, it is an intriguing way to spend an afternoon. And it creates reports with enough surprises and insights to suggest that there is something complex and potentially powerful going on as that protected disk whirls around, creating a personality profile of some depth and precision out of a brief true-false test.

Mind Prober
Human Edge Software Corporation
2445 Faber Place
Palo Alto, CA 94303
$29.95 (Commodore 64 version)
$49.95 (All other versions)

Fifty Mission Crush For Atari, Apple, 64

James V. Trunzo

System requirements: Atari computer with at least 40K RAM, a disk drive, and BASIC; Apple II-series computer with at least 48K RAM and a disk drive; Commodore 64 with a disk drive.

Now you have a chance to pilot a legendary Flying Fortress while making bombing runs over Nazi Germany, France, and the Netherlands. *Fifty Mission Crush* recreates the excitement and dangers experienced by B-17 pilots flying with the Eighth Air Force based in Britain during World War II. Your goal: Fly 50 missions, rise through the ranks to become a highly decorated brigadier general, and return home in one piece. Easily said—difficult to do.

Starting out as a first lieutenant, you take command of a Flying Fortress and hand-pick your crew. Then you're assigned a target to bomb and sent on your way.

A pseudo role-playing game, *Fifty Mission Crush* requires you to make numerous decisions. Before taking off, for example, you must decide how much fuel you'll need to make the bombing run and return to base, and whether you'll carry an overload of bombs. The more bombs you drop, the more effective your mission; however, an overload can cause a fatal crash during takeoff if you lose an engine.

Throughout the mission, you exercise full control over the B-17. You decide whether to fly in formation, at what altitude to fly, which gunners will

fire at enemy planes, when to use cloud cover, even when to abort the mission—and, of course, when to drop your bombs. Although all these details are controlled from the keyboard, playing the game is very simple thanks to onscreen menus and a short but concise instruction booklet.

Authentic "Feel"

The quality that makes this game special is the "feel" you get while playing it—or rather, while *experiencing* it. When you are passing over enemy antiaircraft batteries guarding your primary target and the screen turns red as flak begins to explode all around your plane, you can begin to appreciate what the real thing must have been like. You sit, tense and apprehensive, as shells burst about you, and you nervously watch the screen for damage reports. Your stomach tightens when you learn that your tailgunner has been shot up and a German FW-190 is firing at your unprotected tail. You suppress a groan upon discovering that your bomb bay doors are damaged, and you are forced to abort the mission because you can't release your payload.

Unlike many role-playing games, however, *Fifty Mission Crush* doesn't necessarily strap you into your computer chair for hours. A single mission can be completed in as little as five minutes, and seldom does a single mission take more than 15 minutes from takeoff to return landing. Also, you can save a game in progress after each mission. This makes *Fifty Mission Crush* perfect for those occasions when you have too much time to do nothing but not enough time to really get involved in a long session with the computer.

The graphics are functional if not spectacular. Tactical and strategic screens show the terrain over which you are flying,

views of your plane, animated combat, and so on. These screens are informational and mechanically accurate, and fit in well with the overall program. The lack of arcade-quality, high-resolution graphics does nothing to detract from the game itself. *Fifty Mission Crush* is a challenging, addictive game that immerses you in the flow of action in a very personal way.

Fifty Mission Crush
Strategic Simulations, Inc.
883 Stierlin Road
Building A-200
Mountain View, CA 94043
$39.95 ©

Lotus 1-2-3 For IBM PCjr

Donald B. Trivette

System requirements: Enhanced Model IBM PCjr. Printer and memory expansion optional.

A quick quiz: What's the best-selling computer program of all time?

I don't know either (where is the *Guinness Book of World Records* when you need it?), but surely a top contender would be Lotus Development Corporation's *Lotus 1-2-3*. This program has been leading several popular best-seller lists for two years.

There are several reasons for *1-2-3*'s popularity, but chief among them is that *1-2-3* is a spreadsheet program, and spreadsheet programs are the darlings of business computing, especially on IBM PCs. Nowadays it seems almost un-American to have a personal computer on your desk without a copy of a spreadsheet program. And *1-2-3* has become the standard by which other spreadsheet programs are measured. Indeed, it's one of the standards by which IBM PC compatibility is measured. You'll notice that the ads for many PC compatibles often stress that their machine runs *1-2-3*.

Now spreadsheets are invading the home. (See this month's "IBM Personal Computing" column.) IBM and Lotus hope that you'll take the spreadsheet you are working on at the office on your PC and finish it at home on your PCjr. But don't bother taking the IBM PC version of the *1-2-3* program home. It won't run on a stock Junior. *That* version of *1-2-3* requires two disk drives and at least 192K of memory, which is one disk drive and 64K more than an Enhanced Model PCjr has to offer.

Lotus To The Rescue

Fortunately, Lotus has begun selling a new version of *1-2-3* that's especially designed for the PCjr. Announced in July 1984, the product finally became available in December. It comes on two ROM cartridges and a floppy disk. Either cartridge may be plugged into either of the PCjr's two cartridge slots. The disk contains the help file and utility programs. Although the disk must be inserted in the drive when *1-2-3* is started, you can replace it with your work disk afterward.

Here's the first question an experienced *1-2-3* user will probably ask: Is the PCjr version the same as the PC version? The answer is yes. The manual for the PCjr version is identical, page for page, to the one for the PC—with the following exceptions. Several names have been added to the credits on the title page; and the "Getting Started" section on pages i through xi describes how to install *1-2-3* on the PCjr. Those are the only differences.

The second likely question: How much room is available for a spreadsheet on a 128K IBM PCjr? The answer is 39,500 bytes. Not a lot. That can be increased to 45,700 if you bypass the Lotus Access System (File Manager, PrintGraph, Translate, etc.) and run *1-2-3* directly from the Disk Operating System. That's still not much for those accustomed to having 300,000 bytes available for their work, but it is sufficient for many applications.

With 45,700 bytes, for instance, you can create a spreadsheet 26 columns across (A–Z) and 100 rows deep containing labels, numbers, and formulas. That's plenty of room for domestic applications, and it accommodates most small business needs.

More Features=Less Memory

Another way to evaluate *1-2-3*'s workspace is to compare it with some competitors. *VisiCalc*, another popular spreadsheet program, leaves you with 71,600 bytes available for work, and *MultiPlan*, Microsoft's entry, has 55,500 bytes available. (All of these comparisons are on a 128K PCjr.) It's a tradeoff: The more sophisticated the program, the less space is left for your data.

Of course, if your spreadsheets need to grow beyond 45,000 bytes, you can expand the PCjr's memory all the way up to 512K RAM.

Another important question is calculating speed. *Lotus 1-2-3* doesn't run particularly fast even on a PC, and the PCjr is a slower machine. The PCjr version took several seconds to recalculate a test spreadsheet of 45,000 bytes. Presumably, a spreadsheet of several hundred thousand bytes would take noticeably longer on the PCjr than on the PC, but for anything that

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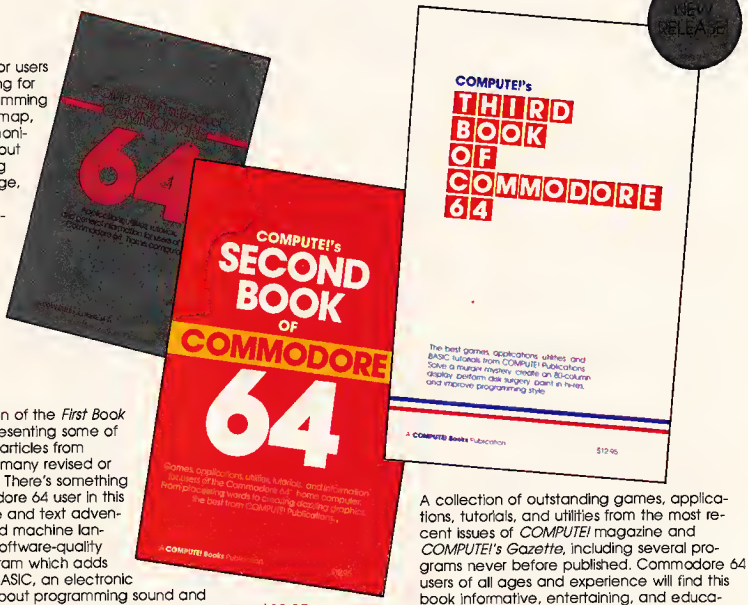

An excellent resource for users of the 64, with something for everyone: BASIC programming techniques, a memory map, o machine language monitor, and information about writing games and using peripherals. This 264-page, spiral-bound book includes many ready-to-type-in programs and games. $12.95

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will fit in 45,000 bytes, the recalculating time is reasonable.

Lotus 1-2-3 is not an inexpensive program—it costs $495.00 retail. But it's available from some discounters for as little as $319.95. A salesperson at one such outlet said the PCjr version of *1-2-3* is selling very well. If true, it looks like Lotus is going to remain on the best-seller's list for a long time to come.

Lotus 1-2-3
Lotus Development Corporation
161 1st Street
Cambridge, MA 02142
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You pay only $139.00 when you order the powerful 84K COMMODORE 64 COMPUTER! LESS the value of the SPECIAL SOFTWARE COUPON we pack with your computer that allows you to SAVE OVER $500 off software sale prices!! With only $100 of savings applied, your net computer cost is $39.00!!

* 170K DISK DRIVE $195.00
You pay only $195.00 when you order the 170K Disk Drive! LESS the value of the SPECIAL SOFTWARE COUPON we pack with your disk drive that allows you to SAVE OVER $500 off software sale prices!! With only $100 of savings applied, your net disk drive cost is $95.00.

* 80 COLUMN 80 CPS TRACTION/FRICTION PRINTER $169.00
You pay only $169.00 when you order the Comstar T/F deluxe line printer that prints 8½x11 full size, single sheet, roll or fan fold paper, labels, etc. Impact dot matrix, bidirectional. LESS the value of the SPECIAL SOFTWARE COUPON we pack with your printer that allows you to SAVE OVER $500 off software sale prices!! With only $100 of savings applied your net printer cost is only $69.00.

* 13" HI-RES COLOR MONITOR $195.00
You pay only $195.00 when you order this 13" COLOR MONITOR with sharper and clearer resolution than any other color monitors we have tested! LESS value of the SPECIAL DISCOUNT COUPON we pack with your monitor that allows you to save over $500 off software sale prices!! With only $100 of savings applied, your net color monitor cost is only $95.00. (16 Colors).

80 COLUMN BOARD $89.00
Now you program 80 COLUMNS on the screen at one time! Converts your Commodore 64 to 80 COLUMNS when you plug in the 80 COLUMN EXPANSION BOARD!! PLUS 4 slot expander! Can use with most existing software.

80 COLUMNS IN COLOR EXECUTIVE WORD PROCESSOR $39.00
This EXECUTIVE WORD PROCESSOR is the finest available for the COMMODORE 64 computer! The ULTIMATE FOR PROFESSIONAL Word Processing, DISPLAYS 40 or 80 COLUMNS IN COLOR or black and white! Simple to operate, powerful text editing with 250 WORD DICTIONARY, complete cursor and insert/delete key controls line and paragraph insertion, automatic deletion, centering, margin settings and output to all printers! Includes a powerful mail merge.
List $99.00 **SALE $39.00** Coupon $29.95

SPECIAL SOFTWARE COUPON

We pack a SPECIAL SOFTWARE DISCOUNT COUPON with every COMMODORE 64 COMPUTER DISK DRIVE-PRINTER-MONITOR we sell! This coupon allows you to SAVE OVER $500 OFF SALE PRICES!!

(Examples)
PROFESSIONAL SOFTWARE
COMMODORE 64

Name	List	Sale	Coupon
Executive Word Processor	$99.00	$39.00	$29.95
Executive Data Base	$69.00	$29.00	$19.95
20,000 Word Dictionary	$24.95	$14.95	$10.00
Electronic Spread Sheet	$59.95	$49.00	$29.00
Accounting Pack	$49.00	$39.00	$29.00
Practicalc	$59.95	$34.95	$29.95
Programmers Reference Guide	$20.95	$16.95	$12.50
Programmers Helper (Disk)	$59.95	$39.95	$29.95
80 Column Screen (Disk)	$59.95	$39.95	$29.95
Disk Filer (by Flip-N-File)	$39.95	$14.95	$12.95
Deluxe Tape Cassette	$89.00	$39.00	$29.95
Pro Joy Stick	$24.95	$15.95	$12.00
Light Pen	$39.95	$14.95	$ 9.95
Dust Cover	$ 8.95	$ 6.95	$ 4.60
Page Jae	$29.95	$19.95	$16.95
Pilstop II Epyx	$39.95	$24.95	$19.95
		* Plus One FREE	
Music Calc 1	$59.95	$39.95	$34.95
Filewriter	$59.95	$39.95	$34.95

(See over 100 coupon items in our catalog)
Write or call for
Sample SPECIAL SOFTWARE COUPON!

EXECUTIVE QUALITY PROFESSIONAL BUSINESS SOFTWARE

The Cadillac of Business Programs
for Commadare 64 Computers

Item	List	* Sale	Coupon
Inventory Management	$99.00	$34.95	$29.95
Accounts Receivable	$99.00	$34.95	$29.95
Accounts Payable	$99.00	$34.95	$29.95
Payroll	$99.00	$34.95	$29.95
General Ledger	$99.00	$34.95	$29.95

* SUPER AUTO DIAL MODEM $59.00
Easy to use. Just plug into your Commodore 64 computer and you're ready to transmit and receive messages. Easier to use than dialing your telephone, just push one key on your computer! Includes exclusive easy to use program for up and down loading to printer and disk drives. List $129.00 **SALE $59.00**.

NEW COMPUTER LEARNING PAD $39.95
Makes other graphics tablets obsolete. This new TECH SKETCH LEARNING PAD allows you to draw on your T.V. or Monitor and then you can print whatever you draw on the screen on your printers. FANTASTIC!!! List $79.95 **SALE $39.95.**

NEW VOICE SYNTHESIZER $59.00
For Com-64 or VIC-20 computers. Just plug it in and you can program words and sentences, adjust volume and pitch, make talking adventure games, sound action games and customized talkies!! FOR ONLY $19.95 you can add TEXT TO SPEECH, just type a word and hear your computer talk — ADD SOUND TO "Zork", SCOTT ADAMS AND AARDVARK ADVENTURE GAMES!! (Disk or tape.)

12" GREEN OR AMBER MONITOR $79.95
Your choice of green or amber screen monitor, top quality, 80 columns x 24 lines, easy to read, anti-glare! PLUS $9.95 for connecting cable. Com-64 or VIC-20.

13" DAISY WHEEL PRINTER $249.00
"JUKI" Superb letter quality daisy wheel printer, 13" extra large carriage, up to 12 CPS bi-directional printing, drop in cassette ribbon, centronics parallel or RS232 serial port built in! (Specify)
List $399.00 **SALE $249.00**

COM-64 4 SLOT EXPANSION BOARD $29.95
Easy to use, switch selectable, reset button and LED indicator — saves your computer and cartridges.
List $79.00 **Sale $29.95**

FLOPPY DISK SALE 98¢
Lowest prices in the U.S.A.!! Single sided single density, with hub rings, quality guaranteed! (100 bulkpack 98¢ ea.) (Box of 10 $12.00)

PHONE ORDERS
8 a.m. - 8 p.m. Weekdays
9 a.m. - 12 naan Saturdays

• LOWEST PRICES • 15 DAY FREE TRIAL • 90 DAY FREE REPLACEMENT WARRANTY
• BEST SERVICE IN U.S.A. • ONE DAY EXPRESS MAIL • OVER 500 PROGRAMS • FREE CATALOGS

Add $10.00 for shipping, handling and insurance. Illinois residents please add 6% tax. Add $20.00 for CANADA, PUERTO RICO, HAWAII ALASKA, APO-FPO orders. Canadian orders must be in U.S. dollars. WE DO NOT EXPORT TO OTHER COUNTRIES.

Enclose Cashiers Check, Money Order or Personal Check. Allow 14 days for delivery. 2 to 7 days for phone orders. 1 day express mail!
VISA — MASTER CARD — C.O.D.

PROTECTO
We Love Our Customers
Box 550, Barrington, Illinois 60010
312/382-5244 to order

NEW 128K —MEGA BYTE DUAL DISK DRIVE—80 COLUMN

COMPUTER SYSTEM SALE!

HOME • BUSINESS • WORD PROCESSING

LOOK AT ALL YOU GET FOR ONLY **$795.**

	LIST PRICE
① B128 COMMODORE 128K 80 COLUMN COMPUTER	$ 995.00
② 4023 - 100 CPS - 80 COLUMN BIDIRECTIONAL PRINTER	499.00
③ 8050 DUAL DISK DRIVE (over 1 million bytes)	1795.00
④ 12" HI RESOLUTION 80 COLUMN MONITOR	249.00
• BOX OF 10 LORAN LIFETIME GUARANTEED DISKS	49.95
• 1100 SHEETS FANFOLD PAPER	19.95
• ALL CABLES NEEDED FOR INTERFACING	102.05
TOTAL LIST PRICE	**$3717.95**

$795 SALE PRICE

PLUS YOU CAN ORDER THESE BUSINESS PROGRAMS AT SALE PRICES

Programmers Reference Guide List $29.95 **Sale $24.95**

	LIST	SALE	*SYSTEM PRICE**
Professianol 80 Column Word Pracessar	$149.95	**$99.00**	***$49.00***
Professianal Data Base	$149.95	**$99.00**	***$49.00***
Accaunts Receivable	$149.95	**$99.00**	
Accaunts Payable	$149.95	**$99.00**	
Payroll	$149.95	**$99.00**	
Inventary	$149.95	**$99.00**	
General Ledger	$149.95	**$99.00**	
Financial Spread Sheet	$149.95	**$99.00**	
Order Entry	$149.95	**$99.00**	

* When Bought with B128 Computer System.

☆ PRINTER REPLACEMENT OPTIONS

(replace the 4023 with the following printers at these sale prices. Interface Included)

	LIST	SALE
☆ Olympia Executive Letter Quality Printer	$699.00	**$369.00**
☆ Comstor Hi-Speed 160 CPS 15½" Business Printer	$779.00	**$459.00**
Telecommunicotions Deluxe Modem Package	$199.00	**$139.00**
IEEE to Centronics Parallel Printer Interface	$179.00	**$139.00**

15 DAY FREE TRIAL. We give you 15 days to try out this SUPER SYSTEM PACKAGE!! If it doesn't meet your expectations, just send it back to us prepaid and we will refund your purchase price!!
90 DAY IMMEDIATE REPLACEMENT WARRANTY. If any of the SUPER SYSTEM PACKAGE equipment or programs fail due to faulty workmanship or material we will replace it IMMEDIATELY with no service charge!!

Add $50.00 for shipping and handling!!
WE DO NOT SHIP THIS SYSTEM TO FOREIGN COUNTRIES, CANADA, PUERTO RICA, ALASKA, OR HAWAII.
Enclose Cashiers Check, Money Order or Personal Check. Allow 14 days for delivery. 2 to 7 days for phone orders, 1 day express mail! We accept Visa and MasterCard. We ship C.O.D. to continental U.S. addresses only.

PROTECTO ENTERPRIZES (WE LOVE OUR CUSTOMERS!)
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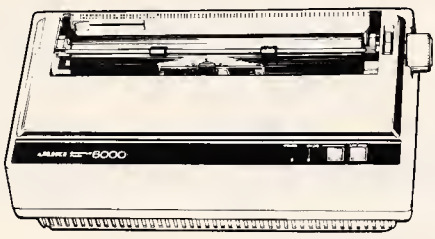
DAISY WHEEL PRINTER SALE!

JUKI®

(Japanese Highest Quality Award Winner)



Letter Quality Printer

Letter Quality Printer/Typewriter

DELUXE LETTER QUALITY "DAISY WHEEL PRINTERS"

JUKI®

DELUXE COMPUTER PRINTER

List Price $399 **SALE $249**

- Superb "Daisy Wheel" Computer Printer
- 100 Characters
- Bi-directional with special print enhancements-many type styl* $18.95
- Pitch 10, 12, 15 CPI
- Print Speed up to 12 CPS
- Print line width: 115, 138, 172 characters
- 12" Extra large carriage
- Drop in cassette ribbon (replacement $8.95)
- Centronics parallel RS 232 Serial interface built in (specify)

JUKI®

DELUXE "COMBINATION" PRINTER/TYPEWRITER

List Price $499 **SALE $299**

- Superb Computer Business Printer combined with the deluxe electronic typewriter!
- Two machines in one—just a flick of the switch!
- Superb letter quality correspondence—home, office, word processing!
- 12" Extra large carriage
- Drop in cassette ribbon—replacement $8.95
- Precision daisy wheel printing—many type styles! $18.95
- Pitch selector-10, 12, 15 CPS, Automatic relocate key!
- Automatic margin control and setting! Key in buffer!
- Centronics parallel or RS 232 Serial interface built-in (specify)

15 Day Free Trial - 90 Day Immediate Replacement Warranty

- COMMODORE 64 COMPUTER INTERFACE ONLY $49.00 - ATARI INTERFACE $79.00

ADD $10.00 for shipping and handling!!

Enclose Cashiers Check, Money Order or Personal Check. Allow 14 days for delivery, 2 to 7 days for phone orders, 1 day express mail! Canada orders must be in U S dollars VISA — MASTER CARD ACCEPTED. We ship C.O.D

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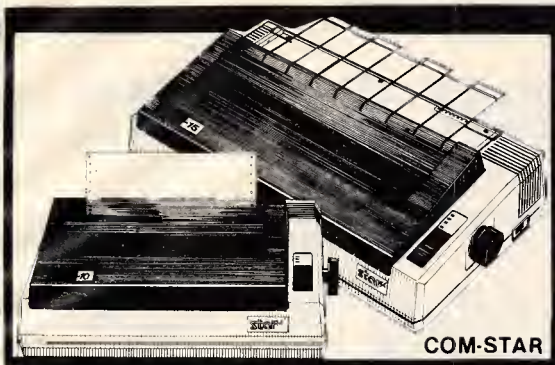
FANTASTIC COMPUTER PRINTER SALE!!!



COM-STAR T/F

Tractor
Friction
Printer

only $ 169**

- Lowest Priced, Best Quality, Tractor-Friction Printers in the U.S.A.
- Fast 80-120-160 Characters Per Second • 40, 46, 66, 80, 96, 132 Characters Per Line Spacing
- Word Processing • Print Labels, Letters, Graphs and Tables • List Your Programs
- Print Out Data from Modem Services • "The Most Important Accessory for Your Computer"

** DELUXE COMSTAR T/F 80 CPS Printer $169.00

This COMSTAR T/F (Tractor Friction) PRINTER is exceptionally versatile. It prints 8½" x 11" standard size single sheet stationary or continuous feed computer paper. Bi-directional, impact dot matrix, 80 CPS, 224 characters. (Centronics Parallel Interface).

Premium Quality 120-140 CPS 10X COM-STAR PLUS+ Printer $199

The COM-STAR PLUS+ gives you all the features of the COMSTAR T/F PRINTER plus a 10" carriage, 120-140 CPS, 9 x 9 dot matrix with double strike capability for 18 x 18 dot matrix (near letter quality), high resolution bit image (120 x 144 dot matrix), underlining, back spacing, true lower decenders with super & subscripts, prints standard, italic, block graphics & special characters. It gives you print quality and features found on printers costing twice as much!! (Centronics Parallel Interface) (Better than Epson FX80). RATED "BEST BUY" BY CONSUMERS DIGEST BUYERS GUIDE, JANUARY 1985! List $499.00. **Sale $199.00.**

Premium Quality 120-140 CPS 15½X COM-STAR PLUS+ Business Printer $319.00

Has all the features of the 10" COM-STAR PLUS+ PRINTER plus 15½" carriage and more powerful electronics components to handle large ledger business forms! (Better than Epson FX 100). List $599. **Sale $319.00.**

Superior Quality 15½" COM-STAR PLUS+ H.S. High Speed 160-180 CPS Business Printer $449.00

15½" Carriage and more powerful electronic components to handle larger ledger business forms! (Serial Centronics Parallel Interface). List $799. **Sale $449.**

12" DAISY WHEEL PRINTER $249.00

"JUKI" Superb letter quality daisy wheel printer, 12" extra large carriage, up to 12CPS bi-directional printing, drop-in cassette ribbon, (90 day warranty) centronics parallel or RS232 serial port built in! (Specify). List $399.00. **Sale $249.00.**

Superior Quality 10" COM-STAR+ H.S. HIGH SPEED 160-180 CPS Business Printer $349.00

This **Super High Speed Com-Star+ Business Printer** has all the features of the 10" COM-STAR+ PRINTER with HIGH SPEED BUSINESS PRINTING 160-180 CPS, 100% duty cycle, 8K Buffer, diverse character fonts, special symbols and true decenders, vertical and horizontal tabs. A **RED HOT BUSINESS PRINTER** at an unbelievable low price (Serial or Centronics Parallel Interface). List $699.00.
Sale $349.00.

Printer/Typewriter Combination $299.00

"JUKI" Superb letter quality, daisy wheel printer/typewriter combination. Two machines in one — just a flick of the switch. 12" extra large carriage, typewriter keyboard, automatic margin control and relocate key drop in cassette ribbon! (90 day warranty) centronics parallel or RS232 serial port built in (Specify). List $499.00. **Sale $299.00.**

• 15 Day Free Trial - 1 Year Immediate Replacement Warranty

PARALLEL INTERFACES

For VIC-20 and COM-64 — $49.00. Commodore B-128 — $139.00. Apple — $79.00. Atari — $79.00.

Add $14.50 for shipping, handling and insurance. Illinois residents please add 6% tax. Add $29.00 for CANADA, PUERTO RICO, HAWAII, ALASKA, APO-FPO orders. Canadian orders must be in U.S. dollars. WE DO NOT EXPORT TO OTHER COUNTRIES.

Enclose Cashiers Check, Money Order or Personal Check. Allow 14 days for delivery. 2 to 7 days for phone orders. 1 day express mail!

VISA—MASTER CARD—We Ship C.O.D. to U.S. Addresses Only

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COM-STAR PLUS+ Print Example: ABCDEFGHIJKLMNOPQRSTUVWXYZ 1234567890

COLOR MONITOR SALE!!!

(Lowest price in USA)

- Built in speaker and audio
- Front Panel Controls
- For Video Recorders
- For Small Business/ Computers
- Apple-Commodore Atari-Franklin-etc.

13" Color Computer Monitor

16 COLORS

- Beautiful Color Contrast
- High Resolution
- Separated Video
- Sharp Clear Text
- Anti Glare Screen
- 40 Columns x 24 lines
- Supports 80 Columns
- List $399

SALE **$195**

15 Day Free Trial - 90 Day Immediate Replacement Warranty

12" XTRON SUPER HI-RESOLUTION "SWIVEL BASE" MONITOR

List $249 **SALE $119** *

80 Columns x 24 lines, Super Hi-Resolution 1000 lines
Green or Amber super-cleor Easy to Reod text with special anti-glare screen!

12" ZENITH HI-RESOLUTION GREEN OR AMBER TEXT DISPLAY MONITOR List $199 **SALE $99** *

80 Columns x 24 lines, Hi-Resolution-crisp cleor eosy to reod text with anti-glore screen! A MUST for word processing.

12" MONITOR GREEN OR AMBER TEXT

80 Columns x 24 lines, easy to reod up front controls

List $159 **SALE $79.95** *

***Plus $9.95 connecting cable!**

• LOWEST PRICES • 15 DAY FREE TRIAL • 90 DAY FREE REPLACEMENT WARRANTY
• BEST SERVICE IN U.S.A. • ONE DAY EXPRESS MAIL • OVER 500 PROGRAMS • FREE CATALOGS

Add $10.00 for shipping, handling and insurance. Illinois rasidents plaase add 6% tax. Add $20.00 for CANADA, PUERTO RICO, HAWAII orders. WE DO NOT EXPORT TO OTHER COUNTRIES.

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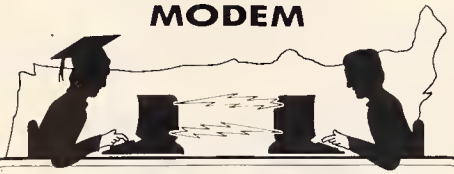
Phone 312/382-5244 to order

Sale

Commodore 64 MODEM

Sale



$59 List $129.95

Telecommunications

$59 List $129.95

FOR CHILDREN·ADULTS·BUSINESS

Complete Auto Dial Telecommunications Package

"The only telecommunications package you will ever need."

(Exclusive Easy To Use Features)

NEW

Total Telecommunications

NEW

• 300 Baud Modem • Auto Dial • Auto Answer • Upload & Download

• Membership in 52 Database Services (UPI News, etc.)

Reach Out and Access Someone

- Educatianal courses
- Financial Information
- Banking at Hame
- Papular Games
- News Updates and Infarmatian
- Electranic Shapping
- Research and Reference Materials

The Total Telecommonications Package offers you all this plus ...

- Auto Log-on
- Dioling from Keyboord
- On-line Clock
- Copture ond Display High Resolution Charocters
- Downlood Text, Progrom or Doto Files
- Stores on Disk Downlooded Files
- Reods Files from Disk ond Uploods Text or Progrom Files
- Select Any Protocol (occess olmost any computer or modem)
- Plus Much, Much More

List $129.95

Special Low-Low Price $59.00

We ore so sure this is the only telecommunicotions pockoge you will need we will give you 15 doys Free Triol.

Add $3.00 for shipping handling and insurance Illinois residents please add 6% tax Add $6.00 for CANADA PUERTO RICO HAWAII ALASKA APO·FPO orders Canadian orders must be in U.S. dollars WE DO NOT EXPORT TO OTHER COUNTRIES

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VISA MASTER CARD C.O.D.

No C.O.D. to Canada APO FPO

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COMMODORE-64

VOICE SYNTHESIZER

NEW NEW

MAKE YOUR COMPUTER TALK

VOTRAX BASED HARDWARE

SALE ONLY **$59.00**

You con pragrom any words or sentences • Adjust valume ond pitch • Receive Modem messoges • Moke adventure gomes that tolk • Real sound oction gomes • Moke custamized tolkies • (Dema disk ar tape included)

You con odd TEXT TO SPEECH SOFTWARE thot allows yau to simply type whot you want ta heor!! Also allows you to odd sound ond voice to SCOTT ADAMS ond "ZORK" ADVENTURE GAMES. List $29.95. SALE $19.95. (Disk or Tope).

• LOWEST PRICES • 15 DAY FREE TRIAL • 90 DAY FREE REPLACEMENT WARRANTY
• BEST SERVICE IN U.S.A. • ONE DAY EXPRESS MAIL • OVER 500 PROGRAMS • FREE CATALOOS

COMMODORE 64

80 COLUMN BOARD

SALE

FOR ONLY **$89.00**

(Ward Pracessar Disk Pragram included FREE!!)

Now you con pragram 80 columns an the screen at one time! Canverts your Commadare 64 to 80 columns when you plug in the PROTECTO 80 Expansion 8oard. List $199.00. **Sale $89.00.**

Includes 4 Slot Expander and can be used with most existing software!!!

Add $3.00 for shipping, handling and insurance. Illinois residents please add 6% tax. Add $6.00 for CANADA, PUERTO RICO, HAWAII, ALASKA, APO-FPO orders. Canadian orders must be in U.S. dollars. WE DO NOT EXPORT TO OTHER COUNTRIES.

Enclose Cashiers Check, Money Order or Personal Check. Allow 14 days for delivery, 2 to 7 days for phone orders, 1 day express mail!

VISA — MASTER CARD — C.O.D.

No C.O.D. to Canada, APO-FPO.

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FUJI SALE $1.49 ea.

Premium Quality Floppy Disks

Box of 10 *with hub rings, sleeves and labels*

Famous Brand FUJI Floppy Disks for those who care about keeping their data.

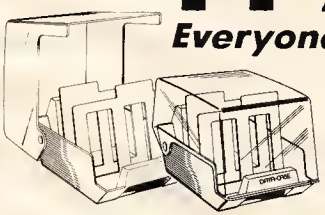
Single Sided — Double Density
for Commodore 64, Atari, Apple

List $39.95
Sale $14.90

*** $12.95** ☆☆ ***Flip-N-File*** ☆☆ *** $12.95**

Data-Case

Floppy Disk Filer



Everyone Needs a Floppy Disk Secretary

Facts:

- Dust and Dirt particles can hurt your disks
- Most disks go bad due to mishandling in storage
- Proper filing of your disk collection will reduce unnecessary handling of your disks

The Floppy Disk Filer is on inexpensive hard plostic Fliptop case thot will allow far eosy filing, ond protect yaur disks from dust, smoke, ond dirt. Plus, the Floppy Disk Filer will keep oll your disks out af unwonted honds and in ane ploce where you con easily find them. **(Holds Over 50 Disks)**

List $24.95 **Introductory Sale Price $14.95** **** Coupon $12.95***

Add $3.00 for shipping handling and insurance. Illinois residents please add 6% tax. Add $6.00 for CANADA, PUERTO RICO, HAWAII ALASKA, APO-FPO orders. Canadian orders must be in U.S. dollars WE DO NOT EXPORT TO OTHER COUNTRIES

Enclose Cashiers Check, Money Order or Personal Check. Allow 14 days for delivery. 2 to 7 days for phone orders. 1 day express mail!

VISA - MASTER CARD — C.O.D.

No C.O.D. to Canada, APO FPO

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Commodore 64 **CARDCO** Commodore 64

Fulfill All Your Personal & Business Needs "NOW"

Write Now! — Word Processor

Easy To Use Cartridge Based Word Processor for the C-64, With Full 80 Column On-Screen View Mode

The WRITE NOW! word processor provides you with the eosiest to use, fastest to learn format available for your Commodore 64 computer. It will give you all the fetures you would expect in a professional word processar and some features not found in ony other Commodore 64 word processor.
(Cortridge) List $49.95. **Sale $34.95.** *Coupon $29.95.*

- Program is an cartridge and laads instantly so there is no waste of time laading from unreliable tapes or disks.
- Built in 80 calumn display allaws yau ta see exactly what you will print including headers, footers, justification, page numbers and page breaks.
- Can send all special cades to any printer, even in the middle of a line without losing praper justification.
- Page numbering in standard numbers or upper or lawer case Raman numerals.
- Full string search and search/replace functions.
- Direct unlimited use af previously stored text from tape or disk called fram within text during the print out so it uses no memory space and allaws creation of unlimited length documents.
- Full scrolling up and down through text.
- No complicated editing mades or commands.
- Multiple line headers and footers.
- Justification and text centering.
- Block copy and delete commands.
- Save text to tape or disk.
- Easy full screen editing.
- Works with any printer.
- Easy to understand instructian booklet.
- 4 help screens included.

Spell Now — Spell Checker

"Spell Now" is a disk bosed professional spelling checker that interfaces with the "Write Now" word processor for the C-64. Use "Spell Now" to check the spelling in your "Write Now" files. It includes oll feotures of the most expensive spelling checkers on the morket. (Disk) List $39.95. **Sale $19.95.**

- 34,000 word dictianary.
- 1,000 ward mini-dictionary.
- Unlimited number of supplemental dictianaries (user-definable).
- Yau see status of spelling check.
- Menu-driven; user-friendly.
- Fully campatible with "Write Naw".
- Allows for marking, immediate correction and viewing in context.
- CARDCO, INC.'s Lifetime Guarantee.

Mail Now — Mailing List Software

The "Moil Now" is o disk bosed full rondom access doto base designed to be used with the "Write Now" word processor. "Moil Now" allows the user to merge an address file into the text of the word processor for form letters. (Disk) List $39.95. **Sale $19.95.**

- Machine language fast sort.
- User-friendly, totally menu-driven operation.
- 10 character comment line.
- User-defined, print format can print one, two or three labels across.
- 2 character categary field.
- Supports 600 entries per disk.
- Quick (in memory) sorts by Zip, Category, Last name and State.
- Includes data back-up utility.
- CARDCO, INC.'s Lifetime Guarantee.

File Now — Database

"File Now" is the inexpensive data base you've been waiting for. "File Now" interfaces with the "Write Now" word processor for the C-64. Helps you with dato base manogement of your "Write Now" files ond keeps seporote doto bases for other importont informotion. (Disk) List $39.95. **Sale $29.95.**

- Functions as a deck of 3 x 5 nate cards.
- Fields are user-definable.
- Full edit features; add, edit, delete.
- Searching is bidirectional.
- Wild card searching and printing.
- Capacity up to 700 cards per file-disk.
- Fully compatible with "Write Now".
- CARDCO, INC.'s Lifetime Guarantee.

Graph Now / Paint Now — Graphic/Logo Generator

A full graphics pockage copoble of generoting line, bor graphs and graphic ort designs such os logos ond pictures to be used with "Write Now" for the C-64. Save your graph or logo in a "Write Now" compotible file ond print it out olong with your "Write Now" text file. (Disk) List $39.95. **Sale $19.95.**

- Allaws platting of x,y coordinates from software or keyboard.
- Campatible with "Write Now" files.
- Menu-driven; user-friendly.
- Draw lines, rectangles and circles.
- 3 fill shades; white, gray and black
- Character font editor
- Load or save graphics.
- Optional joystick control.
- CARDCO INC.'s Lifetime Guarantee.

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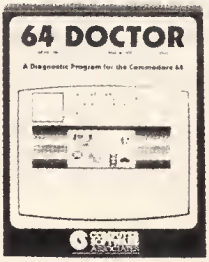
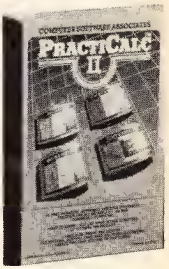
• Test RAM Memory • RS-232 Port • Keyboard • Video • Audio • Jaystick • Printer • Disk Drive • And More!





Practicalc 64: A consistent best seller, Practicalc 64 has become a reference standard among Commodore 64 spreadsheets. With features like alphabetic and numeric sorting and searching, variable comumn widths, graphing and over 30 math functions, this program is an exceptional value. Practicalc 64 also interacts with Practifile, forming the perfect small business bundle.
List $59.95. **Sale $24.95.** (Disk or Tape)

Practifile: Flexibility and large capacity make Practifile the ideal data-base manager for the Commodore 64. (3800 records per file, sorts 5 fields at once.) Files written with the program are compatible with Practicalc 64 and popular word processing programs such as EasyScript, Word Pro, PageMate and PaperClip. Finally, a full-featured data-base at an affordable price!
List $59.95. **Sale $24.95.** (Disk.)

64 Dactar: A special diagnostic program for the Commodore 64, 64 Doctor takes the guesswork out of isolating troublesome hardware problems. The program tests each piece of hardware to pinpoint defects and help prevent costly and time-consuming service calls. An essential program for all Commodore 64 users!
List $34.95. **Sale $19.95.** (Disk.)

PractiCalc II *Better than Lotus 1-2-3* *Coupon $44.95*

PractiCalc II, a fast, versatile spreadsheet with database and ward processing features, daes away with erasers, braken pencils and a wastebasket filled with scrap paper. PractiCalc II, with its functians and features, has the ability to complete simple and complex tasks. PractiCalc II is flexible enough to be used for checkbooks, alphabetized lists, home budgets and business financial statements. PractiCalc II is the tool of the eighties. List $69.95. **Sale $49.95.** Coupon $44.95. (Disk)

With PractiCalc II you can:

- Use 250 rows by 100 columns
- Use 36 math functians from simple addition to square roats and trig functions.
- Sort alphabeticolly and numerically.
- Use upper and lawer case letters.
- "Hide" columns of numbers for special reports without lasing data.
- Create fixed titles af several raws and/or columns.
- Replicate any data in any area.
- Adjust individual column widths.
- Use graphic display aption.
- Set global and individual cell farmatting.
- Use IF ... THEN statements.
- Edit labels and farmulas.
- Format disks fram within the program.
- View disk catalag fram within the program.
- Write expanded labels up to 88 characters long.
- Insert, delete and mave information with ease.
- Start using PractiCalc II within ten minutes af opening the package.
- Consolidate separate spreadsheets for tatolling.
- Search for known and variable entries.

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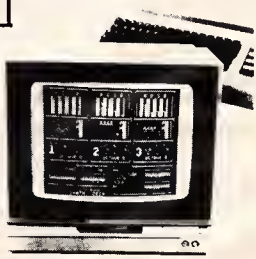
Now yau get this **Fantastic Tech Sketch Computer Light Pen Program** with a **Professional Light Pen Free!** ($39.95 value) plus the **Micro Illustrated Graphics Pen Program** that allows yau ta draw an your T.V. or manitor screen (better than Gibsons $99 light pen). Whatever you can draw on the screen you can print on your printer (A Tech Sketch Exclusive.) (Disk) List $59.95 **Sale $37.95.**

Alsa available is **Lite Sprite**, a light pen driven sprite builder (List $39.95 **Sale $29.95**).

MUSIC PORT

The ultimote music synthesizer ond multi-track recording system for the Commodore 64. A **Full-sized REAL Keyboard** and oll softwore including printing to the printer and preprogrammed songs ore included. (Disk) List $149.95 **Sale $99.00.**



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All programs were written by teachers and have been classroom validated. These programs teach in a standard classroom format with rewards as the user gets through the various lessons.

(Disk)

US Geagraphy Facts — Has 35 pre-programmed lessans plus an autharing system that lets you create your own lessons. Excellent far teaching and reinforcing factual knowledge af the U.S. After completing twa lessons the user earns the right to play a unique and challenging maze game. Fantastic educatianal value.
List $29.95. **Sale $16.95.**

US Gavernment Facts — 35 lessons plus autharing system included. This program was designed far the fallowing: • Eighth grade American History • Ninth grade Civics • High Schaal electives in gavernment • College refresher courses in government and American History. Fantastic aid ta learning abaut American gavernment.
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(Disk)

Commodore 64

(Disk)

AEC Spelling — A series af seven educatianal software programs far grades 2 thraugh 8. It teaches the spelling af 4,000 words most commanly used in writing (98% of most peaple's writing vacabulary). The word lists used are the result af over 25 years of research inta the writing/spelling needs of children and adults. Each grade level consists af one twa-sided disk with word lists an one side and study activities an the other. The activities are designed to develap mastery in spelling utilizing a Test/Teach/Test approach. A pre-test is used ta find out which wards a user cannat spell correctly. These are recarded on a "Wards To Study" list. The activities far learning these wards are provided. Finally, a past-test is taken by the learner to measure progress. The appraach is simple and rewards are built in. List $99.95. **Special Sale — 7 pragrams $34.95.** *Individual programs $19.95. (Specify grades 2-8).*

(Disk)

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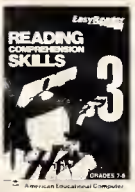

(Disk)

Reading Camprehensian Skills — Reading Camprehensian Skills, 1, 2, and 3 help the learner develap the ability to read with understanding. The learner daes work with cause and effect, similarities and differences, predicting outcomes, finding main ideas, differentiating between fact and opinion, etc.

	List	Sale
Level 1 (grades 1-3)	$29.95	**$16.95**
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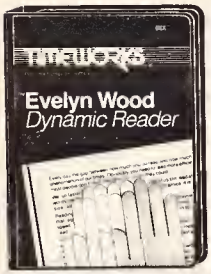

The EVELYN WOOD DYNAMIC READER provides you with the exercises and tools you need to help you increose your reading comprehension and speed. You can use your own personol computer and develop your skills at your own pace. You can learn the essentiol techniques of Dynamic Reading in your own home — at any time that is convenient for you. You can repeat exercises as often as you wish to ossure that you maintain optimal reading efficiency.

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$44.95

Evelyn Wood *Dynamic Reader*

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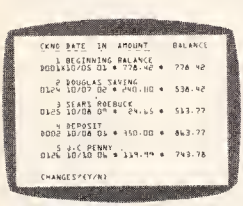
An effective and enjoyable way to improve your reading comprehension, retention and speed.

(See Page 29, 30, 54)

Home Management Sale



Data Manager 1

A general informotion storage and retrieval system — with exclusive "X-SEARCH" Feature.

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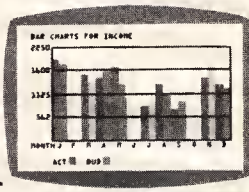

The Electronic Checkbook

Check recording, sorting and boloncing system.

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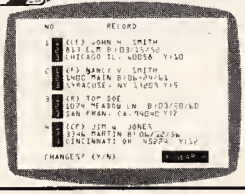

The Money Manager

Home ond business budget and cash flow system.

List $24.95. **Sale $16.95.**

All three Programs for only $44.95

Cave of the Word Wizard

For Commodore 64 Computers

An Intriguing Way to Develop Spelling Skills Using Humon Speech ond Arcode Action.

This stote-of-the-art educational program includes 500 spoken words in 10 spelling skill levels and makes full use of the sound capabilities of your computer. The Wizard will talk to you in cleor humon speech. No odditional hordware is needed for your computer system. (Tape/Disk)

List $39.95. **Sale $22.95.**

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(Grades 5 and up.)
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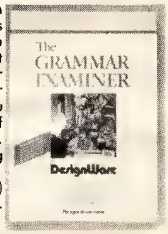
Sale $24.95.

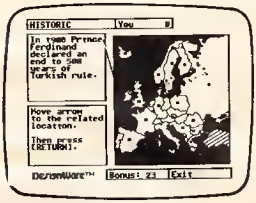


Spellakazam

Race the magician to spell over 400 prepared words (or enter your own). If you succeed you release the animals, otherwise you seal their fate. (Ages 7 and up) (Disk.)
List $34.95.
Sale $19.95.

States & Traits

Learn about U.S. geography ond the famous facts of eoch state. You must piece states in with only mountains and river. Traits include problems like bordering states and rivers, historical facts, current trivia and copitols.
(Ages 9 and up.)
(Disk.) List $44.95.
Sale $27.95.



European Nations And Locations

Learn country nomes, copitols, bordering notions, geographic londmarks, major mountain ronges,rivers and lokes, historicol and cultural facts, and where they belong on a map in ochollenging ond fun game for the whole fomily.Fontastic way to learn obout the countries of Europe. (Disk) List $44.95 Sole **$29.95.**

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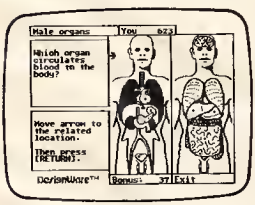

The Body Transparent

Teaches the names, locations, and functions of orgons and bones in the humon body, plus importont focts obout them. Includes both the male ond femole body, so you can learn the similorities ond differences between them. Move bones and orgons to the proper ports of the body ond motch correct parts to the focts and functions presented. Fontastic educotion of the Humon Body.
(Disk) List $44.95 **Sale $29.95.**

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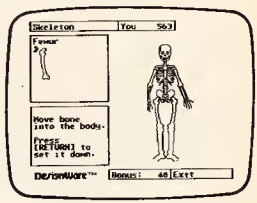

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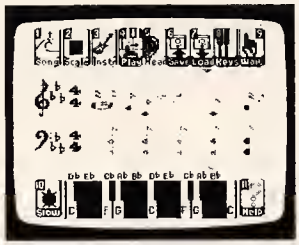
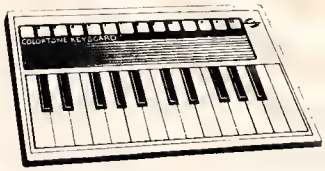
$29.95 KEYBOARD $29.95

- Ploy "no-fault" music instontly
- Never hit o saur note
- Play eight different instruments
- Ploy along with backgraund rhythms
- Moke yaur own music
- Develop musical competence and confidence
- Learn notes an o music keyboord
- Develop sense of rhythm
- Begin leorning music theory





ColorTone Keyboord — Now you can play and learn just like on an organ. Just point to one af the colortone's preset songs, change the musical scale you are playing in or make your Cammodore 64 saund like one of eight different instruments. As yau play, yau'll see the notes you're hearing displayed on a musical staff then recard your musical creatians to listen to them again and again. List $59.95. **Sole $29.95.**

Turn Your Commodore-64 Into A Sophisticated Musical Instrument

"The Program That Gives You A Reason To Buy A Commodore-64."
New York Times.

MusiCalc

MusiCalc
ScoreWriter

ScoreWriter

Combine with Musicalc 1 and a graphics printer (Super-10) to produce sheet music from your original composition. (Disk) List $39.95. **Sale $19.95.**

MusiCalc 1
Synthesizer & Sequencer

Synthesizer & Sequencer

This 1st step turn yaur Cammadare-64 inta a sophisticated musical instrument — a three vaice synthesizer and fully interactive step sequencer play along with pre-recarded songs ar develop your own and record the music you create. (Disk)

List $59.00. **Sale $29.95.**

MusiCalc
Keyboard Maker

Keyboard Maker

Turns yaur Commodare-64 into a musical keyboard. Cames with over 30 pre-set keyboard scales from Classical ta Rock. Requires Musicalc 1. (Disk) List $39.95 **Sole $19.95.**

With Musicolc **anyone** con • Moke ond record sophisticoted music • Print out sheet music from your creotions • Turn your computer into o keyboord • **No experience necessary!**

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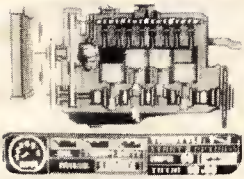
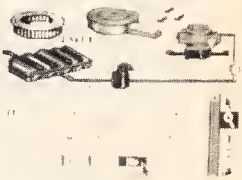
Based on H.G. Wells' science fiction classic, THE TIME MACHINE adds unique joystick action, high-resolution graphics and extensive animation to Wells' ageless prose. Travel through the treacherous time tunnel. Venture into the mysterious land of the future. Befriend the gentle Eloi and struggle to save them from evil Morlocks who lurk in the dangerous underworld. Regain your time machine at all costs — or your tale will end in tragedy! (Disk) List $39.95. **Sale $29.95.**



Injured Engine

Work with an accurate cutaway representation of a functioning automobile engine. Brilliant graphics detail various engine systems and parts. Learn the names of each part and how it relates to the other parts of the engine, then, use your knowledge to diagnose computer-generated engine problems. Inspect and test at will but remember everything costs! Wark against the clock to tune and repair the motor to perfect running condition. (Disk) List $39.95. **Sale $27.95.**



Speak and Seek

It talks!! Speak and Seek teaches the alphabet to children, ages 2-5. It shows children how to print letters in capital and lower cases, pronounces the letter as it is drawn and asks them to find and press the letter on the keyboard. Incorrect answers prompt a variety of helping phrases, such as "Try a little to the right" or "Try higher," and other encouraging and amusing feedback. The make a creature appear that starts with the collect letter. (Disk) List $39.95. **Sale $27.95.**

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Macbeth

Shakespeare's enthralling play of murder, greed and intrigue comes to life in this startlingly textured and vivid treatment. Armed with your wits, an impeccably detailed edition of the Scottish play and a learned mentor who questions and guides your insights and judgements, the play's the thing for you to solve! An engrossing and educational interactive adventure!. (Disk) List $39.95. **Sale $29.95.**

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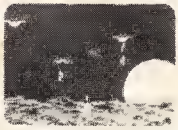
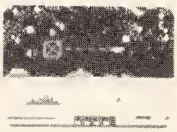


Demon Attack

Winged warriors wreak havoc from above! Only your laser cannon stands between you and oblivion! Blast those bizarre demons. Your arsenal includes missiiles and sheer intestinal fortitude. Only the strong survive! (Disk) List $24.95. **Sale $16.95.**



Nova Blast

Pilot your own Novon Skysweeper above the underwater city. You must defend four cities in your quadrant from alien assault. Use your radar to detect enemy activity. Race to protect these civilized outposts in a deadly game of skill and strrategy. (Disk) List $24.95. **Sale $16.95.**

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Empire III: Armageddon

Michael B. Williams

Requirements: Apple II-series computer with at least 48K RAM and a disk drive.

Empire III: Armageddon is the final chapter in the Empire trilogy. When you assume the role of a character in this world, you find the once-thriving civilization created in *World Builders* and advanced in *Interstellar Sharks* decayed by rebellion, poverty, and the corrupt ruling body. Along with several underground rebel groups, you must overtake the Pyramid and eliminate the Empress.

As in many fantasy role-playing games, your character's attributes and characteristics are determined by the roll of the die. Your success in everything you do depends on your strengths and weaknesses and how well you use them. For example, a high charisma can help you get lower prices on some items, while strength and dexterity will aid you most during battle. Everything but your native class and your name are chosen by chance, including your gender.

During battle, you and your opponent occupy opposite sides of the screen. You determine your attack by such commands as stab, hit, kick, or fire. The battle ends when one of you is killed or gives up. Any wounds received may be healed at the hospital in the city (for a fee, of course).

Armageddon is realistic: Periodically, you must eat and drink to sustain life. Time passes according to where you are and how you move (more time elapses when traversing the wilderness than the city, for example). As your character ages, his abilities and strength weaken, though his intelligence probably increases.

One criticism of *Armageddon* is that the game moves extremely slowly. The display routines appear to be written in BASIC and are painstakingly slow. Disk access is excessive. Another criticism, though common to many games of this type (such as *Wizardry*), is that, after hours of developing a character, one mistake can wipe him out. Since there is no reincarnation in *Armageddon* (and no commercial reincarnation programs as exist for *Wizardry*), one is forced to restart the game from the very beginning.

Despite these drawbacks, *Empire III: Armageddon* is a well thought-out, extremely complex graphic adventure. It will take a lot of time to complete, and will also command much of your patience. *Empire III: Armageddon* nicely ties up the Empire trilogy with a superb challenge for gamers.

Empire III: Armageddon
Peachtree Software
3445 Peachtree Road, N.E.
Atlanta, GA 30326
$32.95

EasyPath For PC & PCjr

Richard Mansfield, Senior Editor

Requirements: IBM PC or PCjr with at least one disk drive and DOS 2.0 or higher.

IBM DOS 2.0 and above are powerful, impressive operating systems, but they do have a few kinks. One of their strengths is that you can define subdirectories to conveniently store related groups of files. However, because of a quirk of the PATH command, you can access only program files within subdirectories, not data files.

Also, many popular programs cannot access subdirectories. If you are word processing, for example, and you want to work on a particular letter, it must be in your current directory. It's more logical to organize letters in a directory called LETTERS and notes in NOTES, etc. However, DOS forces you to copy all such data files into the current directory if you want to access them with your word processor. Some people have solved this by putting a copy of their programs—database managers, spreadsheets, and so on—into *each* relevant subdirectory. Not only does that waste disk space, it still doesn't solve the problem of switching between letters and notes in different directories.

An Easy Solution

All this is solved with Polygon Software's *EasyPath* program. You are given great freedom to define locations and to SET pathlike arguments which will permit any of your programs to access data from anywhere on your floppy or hard disks. *EasyPath* also solves similar problems with RAM disks and piping.

Of particular interest to hard disk users is the EPFILES command, which quickly locates any file or file specification anywhere on the disk. You see a display of all matches and

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Fast Load Cartridge — Lood, save and copy disks five times foster thon normal. It plugs into the cartridge port of the Commodore 64 and goes to work outomaticolly, looding disks with ease. And thot's only the beginning. It con copy o single file, copy the whole disk, send disk commonds, ond even list directories without erosing programs stored in memory. (Cartridge) List $39.95. **Sale $24.95.**

Barbie — The biggest name in dolls. Browse through Borbie's closet full of beoutiful clothing and dress her for the party. You con cut her hair or moke it longer and color it or change the style. Buy new clothing at the boutique or any of the six other specialty shops, or even go to the dress shop ond create Barbie's designer clothes with the help of the computer. The combinations are endless and so is the fun. One or two ployers. (Disk) List $39.95. **Sale $24.95.**

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locations, whether hidden, system, read-only, subdirectory, or altered since previous backup. This wealth of information has a variety of uses. For example, you can quickly determine if you have duplicate files hidden away in forgotten zones within the megabytes of storage. *EasyPath* makes it easier to manage the generous amounts of storage offered by a hard disk.

This product has only one flaw, and it's a flaw that's hard to complain about seriously. *EasyPath* is one of those programs with so many options and features that you're initially stunned by an *embarras de richesses.*

There are so very many ways to use *EasyPath* that at first you can get lost trying to figure out what is essentially a new language. However, the program comes with many prewritten batch files for popular software; a clear, if dense, user guide; and plenty of examples. It's well-supported with help and error screens. It doesn't take long to start solving problems with *EasyPath.* And there seem to be no untoward interactions with other popular background utilities, such as *ProKey,* RAM disks, and *Sidekick.*

EasyPath
Polygon Software Corp.
363 Seventh Avenue
New York, NY 10001
$100

Winnie The Pooh In The Hundred Acre Wood

James V. Trunzo

Requirements: Commodore 64 with a disk drive; or an Apple II-series computer with at least 48K RAM and a disk drive.

Winnie The Pooh In The Hundred Acre Wood is a graphics adventure game designed to be played by a seven-year-old (or any Winnie the Pooh lover), and the biggest and most pleasant surprise is that a child can actually play it! One of the first releases from Walt Disney Personal Computer Software, by way of Sierra, *Winnie The Pooh* is truly an adventure game for children.

The program stresses such diverse skills as creating and reading maps, logical thinking, and reading comprehension. However, this learning is hidden beneath delightful graphics and an intriguing challenge (for a youngster). A blustery wind has blown through the Hundred Acre Wood, scattering the belongings of the beautifully rendered A. A. Milne characters far and wide. It is the player's job to locate the missing articles, identify their owners, and then return them.

Sierra has struck a laudable balance between making the game too easy (and thus boring) or too difficult (and thus frustrating). Except for directional movements, children are not expected to type in the kind of commands normally associated with adventure games, so they don't have to wrestle with the program's vocabulary and syntax recognition.

Sierra has added several other touches to aid youngsters. The Wise Owl is always available in case they find an object they cannot match to a character. A map of the Hundred Acre Wood also is available, although players are urged to make their own map, as well, to keep track of certain objects (only one object can be carried at a time). Finally, the text of the game contains little hints—again, without being so obvious as to dilute the enjoyment and satisfaction a youngster gains from successfully completing a piece of the puzzle.

Winnie The Pooh is a game that a youngster will play more than once. The program scatters the lost objects in different places for each game, and has variations that make it more than just a seek-and-find game. The instructions are simple and concise, and the program is almost completely error-proof. One impressive feature is the ingenious way Sierra built the save-game feature into the program. For starters, no data disk is needed, eliminating the need to swap disks. And the actual procedure is made so easy (you have to look in the toybox in the playroom) that any seven-year-old can do it without trouble. *Winnie The Pooh* is one piece of software that lives up to the promises on its box.

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TurboDisk

High-Speed Disk Loader For Commodore 64 And Expanded VIC-20

Don Lewis

Another breakthrough! Recently COMPUTE! published a startling utility that loads Commodore tapes as fast as 1541 disks (see "TurboTape," January and February 1985). In this issue we're following up with a program that accelerates 1541 disk loading by a factor of three times or more. You'll find that "TurboDisk" is as revolutionary as TurboTape—and just as easy to use.

If you've ever used a really fast disk drive, you know that the Commodore 1541 drive leaves something to be desired—namely, speed. True, it's much faster than a Datassette—at least, a Datassette without "TurboTape"—but it's still annoyingly slow compared to other floppy disk drives with high-speed parallel interfaces.

Now there's a stunning solution: "TurboDisk."

Once you start using TurboDisk, you'll wonder how you got along without it. TurboDisk turbocharges the loading process by a factor of three times or more. In fact, the longer the program, the more improvement you'll see!

TurboDisk requires no modifications to your disk drive or computer. It loads programs saved in the usual manner; no special Turbosave is required. It works with most BASIC and machine language programs, including the DOS Wedge. It does not compromise reliability. And you can switch it on or off at any time by typing a single command.

If you're still skeptical, give TurboDisk a trial—it delivers what it promises.

Preparing TurboDisk

For the Commodore 64, you'll need to type in two programs to prepare TurboDisk: a BASIC program that creates a machine language file on disk (the actual TurboDisk utility); and a short two-line BASIC loader that calls up and activates TurboDisk. For the VIC, a single BASIC program is used to read the TurboDisk machine language from DATA statements and relocate it to the top of available memory.

Program 1 is the BASIC program that creates the 64 version of TurboDisk. Notice all the numbers in DATA statements; these represent the machine language portion of the utility. Be extra careful when typing these lines. We recommend using the "Automatic Proofreader" to prevent as many errors as possible (see "COMPUTE!'s Guide To Typing In Programs" elsewhere in this issue).

Save Program 1 on disk before running it for the first time. That way, if an error causes your computer to lock up, you can switch it off to clear the memory, reload the program, and search for the typing mistake. Otherwise you could lose all of your typing effort.

When Program 1 runs, it prints the message INSERT DISK AND HIT RETURN WHEN READY. Insert a formatted program disk and press RETURN. Program 1 creates a file on the disk with the name TURBODISK.OBJ and then prints the message TURBODISK.OBJ CREATED. You'll probably want copies of TurboDisk on all of your program disks, so rerun the program as many times as necessary.

Program 1 will print an error message if it detects a disk error or a typing mistake in the DATA statements. In addition, the partially written TURBODISK.OBJ file will be scratched from the disk if an error is detected in the DATA.

Finally, if you're using a Commodore 64, you must type in Program 2 and save it on all your program disks with the filename TURBODISK. To load and run TurboDisk, all

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you have to do is enter **LOAD TURBODISK,8** and **RUN**. The short loader will call TURBODISK.OBJ off the disk, place it safely in high memory, and activate it automatically.

VIC TurboDisk

Program 3, for the VIC-20, reads the TurboDisk machine language from DATA statements and POKEs it into the top of available memory, adjusting addresses within the machine language as necessary. This is slower than the scheme used for the 64, but necessary because TurboDisk's position in the VIC depends on the amount of memory installed and whether any other utilities—such as the DOS Wedge—are already in memory. Memory expansion is required to use VIC TurboDisk, but any amount—even 3K—is sufficient. However, TurboDisk will reduce the amount of free memory by 1280 bytes.

As always when entering DATA statements containing machine language, check carefully for typing mistakes, since a single wrong number can cause the program to crash. The Automatic Proofreader should help you avoid some typographical errors. Program 3 also includes internal checks on the DATA statements, and will report an error if the sum of all the DATA items doesn't match its predetermined total.

To install TurboDisk, simply load and run Program 3. If all DATA is correct, the program will tell you the SYS values that will turn TurboDisk on and off (these numbers vary according to the amount of memory expansion). Be sure to make a note of the numbers for later reference. Program 3 will also automatically activate TurboDisk, so you don't need the SYS to start it the first time.

Turbocharged LOADs

Once TurboDisk is activated, no special commands are necessary. Simply type **LOAD "*filename*",8** or **LOAD"*filename*",8,1** as usual. You'll be amazed at the difference.

One thing you will notice immediately is that the red light on the disk drive doesn't come on at all during a Turboload. Don't panic; this is normal. It's also normal for the 64's screen to blank out as TurboDisk works. When the program is loaded, the screen reappears unaltered. The VIC's screen doesn't blank; instead, you'll see the message TURBOLOADING to let you know that the high-speed loading is in progress.

You may occasionally find it necessary to deactivate TurboDisk and use a normal LOAD instead. For example, 1541 disk drives are prone to head alignment problems, so if you have a disk formatted on a drive other than your own, you may find that your drive has difficulty loading programs from it. Since the Turboload routine gives up more easily on difficult loads, you may have to switch to the more forgiving standard LOAD to get the program into your computer. You can switch off 64 TurboDisk at any time without erasing it from memory by entering **SYS 49155**. To reactivate 64 TurboDisk, enter **SYS 49152**. For the VIC, use the SYS values reported by the loader program.

You'll also find it necessary to use the SYS to reactivate TurboDisk after pressing RUN/STOP–RESTORE. Using that key combination to reset the computer effectively disconnects TurboDisk.

There are a few cautions to observe. When using TurboDisk, only one device can be active on the serial bus. Turn off all other devices except for one 1541 disk drive, device number 8. If you are using a printer interface such as Cardco's which gets power from the cassette port, remove the plug from the cassette port before using TurboDisk. If you attempt to Turboload a program and the drive spins continuously but nothing else happens, you have probably forgotten to turn off your printer or unplug your printer interface.

On the Commodore 64, TurboDisk resides in the 4K block of free memory starting at address 49152 (hex $C000), so it's completely safe from BASIC. However, many machine language programs or subroutines also use this memory space and may overwrite TurboDisk. Don't attempt to use TurboDisk to load any program which occupies locations 49152–50431 ($C000–$C4FF).

Since VIC TurboDisk resides at the top of memory, care must be taken to avoid loading a program that is long enough to overwrite the Turbodisk machine language. After running Program 3, type **PRINT INT(FRE(0)/256)**. The value you get is roughly the maximum length in disk blocks for a program to load without disturbing TurboDisk. For example, on a VIC with 8K expansion and both TurboDisk and the VIC-20 Wedge installed, the PRINT above should yield a 38. Thus, for that memory configuration, you should not attempt to Turboload a program that the disk directory shows to be more than 38 blocks long.

TurboDisk speeds up LOADs—even LOADs from within programs, as are common in multipart VIC programs—but it can't speed up SAVEs or VERIFYs. It also doesn't affect the speed of disk file handling with OPEN, PRINT#, GET#, etc. It's not compatible with certain features of some programs, such as saving text files with the *SpeedScript 3.0* word processor, although you can use TurboDisk to load *SpeedScript* in the first place. TurboDisk works with the disk-locking function of "Commodore File Protector" (see

article elsewhere in this issue) but not with the file-locking function. It also may not work with some commercial software.

How TurboDisk Works

The machine language for TurboDisk is unusual in that only half of it works within your computer—the rest is actually executed within the 1541 drive itself. Unlike disk drives for most other computers, Commodore's are *intelligent* units, containing their own microprocessors, RAM, and ROM. This means that they can be programmed for special effects, like Turboloading.

During the brief delay you notice between the time you enter the LOAD command with TurboDisk and the time the drive starts spinning, 420 bytes of machine language code are transferred from the computer to the drive's RAM. This is the portion in the second set of DATA statements in Programs 1 and 3. In the 64, it is stored in locations 49664–50083 ($C200–$C3A3). This required transfer of data before each Turboload adds a certain amount of overhead time, which explains why TurboDisk gives less speed improvement for short programs.

TurboDisk operates by changing the ILOAD vector at locations 816–817 ($330–$331) to point to itself, bypassing the normal LOAD routines in ROM. (These locations are reset to their normal values during the RUN/STOP-RESTORE sequence, which explains why the program must be reactivated after that key combination is pressed.) TurboDisk first checks to see whether a disk directory (LOAD "$",8) or a VERIFY was requested. In either of these cases, control is returned to the ROM routines for normal processing. If a program load was requested, the routine adds the filename to the code for the disk drive portion, then transfers that data to the drive's memory.

The portion of TurboDisk in the disk drive uses routines in the drive's ROM to locate the desired program and read it from the disk sector by sector. To improve speed, drive ROM routines like the one that turns on the red light are omitted, and only the essential ones are used. The 256 bytes of data from each disk sector are transferred two bits at time to a 256-byte buffer within the computer. In the 64, this buffer is at locations 50176–50431 ($C400–$C4FF).

TurboDisk machine language in the computer reads the incoming data from the serial port's DATA and CLK lines, instead of just the DATA line as in normal serial data transfers. Thus, TurboDisk temporarily converts your serial drive into a two-bit parallel drive. When the entire 256 bytes from a disk sector have been transferred into the computer's buffer, data from the buffer is added to the program in memory while the drive is reading the next sector from the disk.

Just How Fast Is It?

Despite a few limitations, TurboDisk is one of the most valuable general-purpose utilities a disk user can own. To discover exactly how fast it is, we ran tests with some programs recently published in COMPUTE!. The test results, shown below, demonstrate how TurboDisk yields the most improvement with medium to long programs. (Results with different disk drives may vary. Figures shown below are for the 64 version.)

After trying TurboDisk yourself, we think you'll agree it's a worthy follow-up to TurboTape.

Program	Blocks	Normal LOAD	Turboload	Factor
Acrobat	31	21 sec	7 sec	3.0
Space Caverns	17	13 sec	5 sec	2.6
64 Paintbox	45	31 sec	9 sec	3.4
Unicopy 64	8	7 sec	5 sec	1.4
SpeedScript 3.0	25	18 sec	6 sec	3.0
SpeedScript 3.0 source code	122	75 sec	17 sec	4.4

Please refer to "COMPUTE!'s Guide To Typing In Programs" before entering these listings.

Program 1: 64 TurboDisk Creator

```
100 PRINT"{CLR}"TAB(206)"{WHT}TURBODISK P
    ROGRAM GENERATOR":PRINT:PRINT   :rem 2
110 PRINT "{CYN}INSERT DISK AND HIT {RVS}
     RETURN {OFF} WHEN READY":PRINT:PRINT
                                    :rem 115
120 GET A$:IF A$<>CHR$(13) THEN 120
                                    :rem 248
130 OPEN 2,8,2,"TURBODISK.OBJ,P,W":GOSUB
    {SPACE}1000                     :rem 100
140 PRINT#2,CHR$(0)CHR$(192);       :rem 78
150 FOR I=0 TO 427:READ A:CK=CK+A:PRINT#2
    ,CHR$(A);:NEXT I                :rem 225
160 IF A<>32 OR CK<>55038 THEN PRINT"
    {RVS}ERROR IN DATA LINES 49152-49578"
    :GOTO 300                       :rem 5
170 FOR I=0 TO 83:PRINT#2,CHR$(234);:NEXT
     I                              :rem 115
180 CK=0:FOR I=0 TO 419:READ A:CK=CK+A:PR
    INT#2,CHR$(A);:NEXT I           :rem 26
190 IF A<>160 OR CK<>43460 THEN PRINT"
    {RVS}ERROR IN DATA LINES 49664-50078"
    :GOTO300                        :rem 49
200 CLOSE 2:PRINT TAB(9)"{7}TURBODISK.OBJ
     CREATED":PRINT:PRINT TAB(10);:rem 74
210 INPUT "ANOTHER COPY (Y/N)";A$:IF A$<>
    "Y" THEN END                    :rem 197
220 RUN                             :rem 137
300 CLOSE 2:CLOSE 15:OPEN 15,8,15,"S0:TUR
    BODISK.OBJ":CLOSE 15:END        :rem 45
1000 CLOSE15:OPEN15,8,15:INPUT#15,E,E$,T,
     S:IF E=0 THEN RETURN           :rem 71
```

```
1010 PRINT "DISK ERROR"E": "E$;T;S
                                    :rem 145
1020 CLOSE15:OPEN15,8,15,"I0:":CLOSE15
                                    :rem 160
49100 REM ** 64 TURBODISK ML        :rem 240
49152 DATA 76,27,192,169,165,141    :rem 63
49158 DATA 48,3,169,244,141,49      :rem 221
49164 DATA 3,160,0,185,41,192       :rem 151
49170 DATA 240,6,32,22,231,200      :rem 184
49176 DATA 208,245,96,169,84,141    :rem 71
49182 DATA 48,3,169,192,141,49      :rem 220
49188 DATA 3,160,21,208,230,13      :rem 196
49194 DATA 84,85,82,66,79,68        :rem 142
49200 DATA 73,83,75,32,68,73        :rem 115
49206 DATA 83,65,66,76,69,68        :rem 135
49212 DATA 13,0,13,84,85,82          :rem 51
49218 DATA 66,79,68,73,83,75        :rem 137
49224 DATA 32,65,67,84,73,86        :rem 124
49230 DATA 65,84,69,68,13,0          :rem 64
49236 DATA 133,147,165,147,208,30:rem 102
49242 DATA 162,16,169,160,157,148:rem 108
49248 DATA 195,202,16,250,160,0     :rem 249
49254 DATA 177,187,201,36,240,12    :rem 50
49260 DATA 177,187,153,148,195,200
                                    :rem 161
49266 DATA 196,183,144,246,176,5    :rem 69
49272 DATA 165,147,76,165,244,32    :rem 62
49278 DATA 69,193,165,186,32,177    :rem 79
49284 DATA 255,169,111,32,147,255:rem 109
49290 DATA 169,85,32,168,255,169    :rem 75
49296 DATA 67,32,168,255,32,174     :rem 18
49302 DATA 255,120,169,11,141,17    :rem 39
49308 DATA 208,32,19,193,44,0       :rem 156
49314 DATA 196,48,76,164,195,166    :rem 75
49320 DATA 196,165,185,240,6,172    :rem 56
49326 DATA 2,196,174,3,196,132      :rem 213
49332 DATA 174,134,175,162,4,32     :rem 254
49338 DATA 251,192,32,19,193,173    :rem 60
49344 DATA 0,196,48,48,240,6        :rem 114
49350 DATA 32,249,192,76,188,192    :rem 69
49356 DATA 162,2,160,0,189,0        :rem 101
49362 DATA 196,145,174,200,232,240
                                    :rem 147
49368 DATA 7,236,1,196,144,242      :rem 216
49374 DATA 240,240,32,6,193,24      :rem 203
49380 DATA 72,169,27,141,17,208      :rem 8
49386 DATA 104,166,174,164,175,88:rem 122
49392 DATA 96,169,4,44,169,0        :rem 124
49398 DATA 56,176,235,162,2,160     :rem 12
49404 DATA 0,189,0,196,145,174      :rem 211
49410 DATA 200,232,208,247,24,152 :rem 86
49416 DATA 101,174,133,174,165,175
                                    :rem 152
49422 DATA 105,0,133,175,96,160     :rem 251
49428 DATA 0,169,11,141,0,221       :rem 142
49434 DATA 173,0,221,16,251,169     :rem 253
49440 DATA 3,141,0,221,162,5         :rem 87
49446 DATA 202,234,208,252,162,4    :rem 46
49452 DATA 173,0,221,10,8,10         :rem 88
49458 DATA 38,149,40,38,149,202     :rem 14
49464 DATA 208,242,165,149,73,255:rem 115
49470 DATA 153,0,196,200,208,209    :rem 46
49476 DATA 96,169,16,133,255,169    :rem 77
49482 DATA 0,133,251,169,194,133    :rem 53
49488 DATA 252,169,0,133,253,169    :rem 65
49494 DATA 5,133,254,165,186,32     :rem 11
49500 DATA 177,255,169,111,32,147:rem 103
49506 DATA 255,165,253,164,254,141
                                    :rem 156
49512 DATA 169,193,140,170,193,160
                                    :rem 153
49518 DATA 0,185,166,193,32,168     :rem 13
49524 DATA 255,200,192,6,208,245    :rem 51
49530 DATA 160,0,177,251,32,168   :rem 253
49536 DATA 255,200,192,32,144,246:rem 101
49542 DATA 165,251,105,31,133,251 :rem 91
49548 DATA 165,252,105,0,133,252   :rem 47
49554 DATA 165,253,105,32,133,253 :rem 99
49560 DATA 165,254,105,0,133,254    :rem 45
49566 DATA 32,174,255,198,255,208:rem 121
49572 DATA 180,96,77,45,87,0       :rem 127
49578 DATA 0,32                    :rem 236
49600 REM ** 1541 TURBODISK ML      :rem 86
49664 DATA 32,66,208,120,169,18     :rem 10
49670 DATA 160,1,141,0,3,140        :rem 86
49676 DATA 1,3,32,186,5,169         :rem 67
49682 DATA 3,133,60,162,0,134     .:rem 148
49688 DATA 75,240,41,160,0,177      :rem 214
49694 DATA 59,201,130,208,25,200    :rem 46
49700 DATA 200,200,185,145,6,201    :rem 31
49706 DATA 42,240,61,201,63,240    :rem 245
49712 DATA 4,209,59,208,7,200      :rem 157
49718 DATA 192,18,240,48,208,234    :rem 61
49724 DATA 230,75,166,75,224,8     :rem 218
49730 DATA 240,7,189,98,5,133       :rem 169
49736 DATA 59,208,208,173,0,3       :rem 163
49742 DATA 240,6,172,1,3,76          :rem 55
49748 DATA 14,5,169,255,141,0       :rem 162
49754 DATA 3,32,133,5,88,76          :rem 68
49760 DATA 69,217,2,34,66,98       :rem 127
49766 DATA 130,162,194,226,230,59:rem 110
49772 DATA 160,0,177,59,141,0       :rem 157
49778 DATA 3,200,177,59,141,1       :rem 162
49784 DATA 3,32,186,5,32,133        :rem 110
49790 DATA 5,173,0,3,208,245        :rem 107
49796 DATA 96,160,0,185,0,3          :rem 64
49802 DATA 133,133,44,0,24,16       :rem 144
49808 DATA 251,169,16,141,0,24      :rem 206
49814 DATA 44,0,24,48,251,162       :rem 155
49820 DATA 4,169,0,6,133,42          :rem 52
49826 DATA 10,6,133,42,10,141       :rem 142
49832 DATA 0,24,202,208,240,72      :rem 195
49838 DATA 104,72,104,169,15,141    :rem 53
49844 DATA 0,24,200,208,206,96      :rem 204
49850 DATA 172,1,3,132,7,173        :rem 102
49856 DATA 0,3,197,6,8,133           :rem 15
49862 DATA 6,40,240,16,169,176      :rem 216
49868 DATA 133,0,88,36,0,48          :rem 69
49874 DATA 252,120,165,0,201,1      :rem 194
49880 DATA 208,78,169,238,141,12    :rem 66
49886 DATA 28,169,6,133,50,169      :rem 229
49892 DATA 0,133,51,133,48,169      :rem 214
49898 DATA 3,133,49,32,58,6          :rem 75
49904 DATA 80,254,184,173,1,28      :rem 214
49910 DATA 153,0,3,200,208,244      :rem 191
49916 DATA 160,186,80,254,184,173:rem 116
49922 DATA 1,28,153,0,1,200          :rem 39
49928 DATA 208,244,32,224,248,165:rem 113
49934 DATA 56,197,71,240,4,169      :rem 225
49940 DATA 34,208,20,32,233,245     :rem 251
49946 DATA 197,58,240,4,169,35      :rem 230
49952 DATA 208,9,169,236,141,12      :rem 10
49958 DATA 28,96,24,105,24,133      :rem 219
49964 DATA 68,169,255,141,0,3       :rem 169
49970 DATA 32,133,5,165,68,76       :rem 171
49976 DATA 200,193,32,64,6,76       :rem 170
49982 DATA 124,6,165,18,133,22      :rem 211
49988 DATA 165,19,133,23,165,6      :rem 224
49994 DATA 133,24,165,7,133,25      :rem 215
50000 DATA 169,0,69,22,69,23         :rem 98
50006 DATA 69,24,69,25,133,26       :rem 155
50012 DATA 32,52,249,162,90,32      :rem 192
```

```
50018 DATA 124,6,80,254,184,173  :rem 252
50024 DATA 1,28,217,36,0,208     :rem 89
50030 DATA 6,200,192,8,208,240   :rem 186
50036 DATA 96,202,208,233,169,32 :rem 46
50042 DATA 208,175,169,208,141,5 :rem 45
50048 DATA 24,169,33,44,5,24     :rem 102
50054 DATA 16,163,44,0,28,48     :rem 99
50060 DATA 246,173,1,28,184,160  :rem 247
50066 DATA 0,96,160,160,160,160  :rem 242
50072 DATA 160,160,160,160,160,160
                                 :rem 126
50078 DATA 160,160,160,160,160,160
                                 :rem 132
```

Program 2: 64 TurboDisk Loader

```
10 IF A=0 THEN A=1:LOAD "TUR8ODISK.O8J",8
   ,1                            :rem 155
20 SYS 49152:NEW                 :rem 138
```

Program 3: VIC TurboDisk Loader

Translation by Ottis Cowper, Technical Editor

```
10 POKE 55,0:POKE 56,PEEK(56)-5:CLR:PRINT
   "{DOWN} VIC TURBODISK LOADER"  :rem 32
20 X=PEEK(56):A1=X*256:PRINT"{DOWN}WRITIN
   G 8LOCK 1"                    :rem 188
30 FOR AD=A1 TO A1+444:READ DT:CK=CK+DT:I
   F DT<0 THEN DT=X-DT-1         :rem 234
40 POKE AD,DT:NEXT:IF CK<>52477 THEN PRIN
   T"{RVS}ERROR IN DATA":PRINT"LINES 1000
   -1444":STOP                   :rem 61
50 CK=0:A2=A1+512:PRINT"WRITING 8LOCK 2"
                                 :rem 75
60 FOR AD=A2 TO A2+419:READ DT:CK=CK+DT
                                 :rem 165
70 POKE AD,DT:NEXT:IF CK<>43460 THEN PRIN
   T"{RVS}ERROR IN DATA":PRINT"LINES 2000
   -2414":STOP                   :rem 55
80 PRINT"DATA OK":PRINT"{DOWN}SYS"A1"TO A
   CTIVATE":PRINT"{DOWN}SYS"A1+3"TO DISA8
   LE"                           :rem 120
90 SYS A1                        :rem 218
999 REM ** VIC TUR8ODISK CODE    :rem 151
1000 DATA 24,144,24,169,73,141   :rem 188
1006 DATA 48,3,169,245,141,49    :rem 154
1012 DATA 3,160,0,185,41,-1      :rem 21
1018 DATA 240,6,32,66,231,200    :rem 133
1024 DATA 208,245,96,169,84,141  :rem 3
1030 DATA 48,3,169,-1,141,49     :rem 90
1036 DATA 3,160,21,208,230,13    :rem 128
1042 DATA 84,85,82,66,79,68      :rem 74
1048 DATA 73,83,75,32,68,73      :rem 65
1054 DATA 83,65,66,76,69,68      :rem 76
1060 DATA 13,0,13,84,85,82       :rem 248
1066 DATA 66,79,68,73,83,75      :rem 78
1072 DATA 32,65,67,84,73,86      :rem 65
1078 DATA 65,84,69,68,13,0       :rem 14
1084 DATA 133,147,165,147,208,30 :rem 43
1090 DATA 160,0,177,187,201,36   :rem 194
1096 DATA 240,22,162,16,169,160  :rem 247
1102 DATA 157,148,-4,202,16,250  :rem 231
1108 DATA 177,187,153,148,-4,200 :rem 40
1114 DATA 196,183,144,246,176,5  :rem 1
1120 DATA 165,147,76,73,245,160  :rem 251
1126 DATA 0,185,138,-1,240,30    :rem 129
1132 DATA 32,66,231,200,208,245  :rem 235
1138 DATA 13,84,85,82,66,79      :rem 70
1144 DATA 76,79,65,68,73,78      :rem 79
1150 DATA 71,46,46,46,13,0       :rem 247
1156 DATA 77,45,87,0,0,32        :rem 206
1162 DATA 169,16,133,255,169,0   :rem 202
1168 DATA 133,251,169,-3,133,252 :rem 37
1174 DATA 169,0,133,253,169,5    :rem 153
1180 DATA 133,254,165,186,32,177 :rem 49
1186 DATA 255,169,111,32,147,255 :rem 50
1192 DATA 165,253,164,254,141,159:rem 100
1198 DATA -1,140,160,-1,160,0    :rem 120
1204 DATA 185,156,-1,32,168,255  :rem 245
1210 DATA 200,192,6,208,245,160  :rem 234
1216 DATA 0,177,251,32,168,255   :rem 199
1222 DATA 200,192,32,144,246,165 :rem 33
1228 DATA 251,105,31,133,251,165 :rem 32
1234 DATA 252,105,0,133,252,165  :rem 235
1240 DATA 253,105,32,133,253,165 :rem 31
1246 DATA 254,105,0,133,254,32   :rem 187
1252 DATA 174,255,198,255,208,180:rem 105
1258 DATA 165,186,32,177,255,169 :rem 65
1264 DATA 111,32,147,255,169,85  :rem 0
1270 DATA 32,168,255,169,67,32   :rem 210
1276 DATA 168,255,32,174,255,120 :rem 49
1282 DATA 32,137,-2,44,0,-5      :rem 28
1288 DATA 48,69,164,195,166,196  :rem 27
1294 DATA 165,185,240,6,172,2    :rem 152
1300 DATA -5,174,3,-5,132,174    :rem 127
1306 DATA 134,175,162,4,32,113   :rem 188
1312 DATA -2,32,137,-2,173,0     :rem 70
1318 DATA -5,48,41,240,6,32      :rem 39
1324 DATA 111,-2,24,144,240,162  :rem 224
1330 DATA 2,160,0,189,0,-5       :rem 234
1336 DATA 145,174,200,232,240,7  :rem 239
1342 DATA 236,1,-5,144,242,240   :rem 181
1348 DATA 240,32,124,-2,24,166   :rem 186
1354 DATA 174,164,175,88,96,169  :rem 22
1360 DATA 4,44,169,0,56,176      :rem 53
1366 DATA 242,162,2,160,0,189    :rem 146
1372 DATA 0,-5,145,174,200,232   :rem 180
1378 DATA 208,247,24,152,101,174 :rem 44
1384 DATA 133,174,165,175,105,0  :rem 248
1390 DATA 133,175,96,160,0,169   :rem 205
1396 DATA 128,141,17,145,173,17  :rem 255
1402 DATA 145,41,2,240,249,169   :rem 195
1408 DATA 0,141,17,145,162,7     :rem 91
1414 DATA 202,234,208,252,162,4  :rem 237
1420 DATA 173,17,145,74,38,149   :rem 206
1426 DATA 74,38,149,234,234,202  :rem 253
1432 DATA 208,242,165,149,73,255 :rem 50
1438 DATA 153,0,-5,200,208,207   :rem 182
1444 DATA 96                     :rem 86
1999 REM ** 1541 TUR8ODISK CODE  :rem 177
2000 DATA 32,66,208,120,169,18   :rem 191
2006 DATA 160,1,141,0,3,140      :rem 20
2012 DATA 1,3,32,186,5,169       :rem 248
2018 DATA 3,133,60,162,0,134     :rem 82
2024 DATA 75,240,41,160,0,177    :rem 139
2030 DATA 59,201,130,208,25,200  :rem 227
2036 DATA 200,200,185,145,6,201  :rem 230
2042 DATA 42,240,61,201,63,240   :rem 179
2048 DATA 4,209,59,208,7,200     :rem 100
2054 DATA 192,18,240,48,208,234  :rem 251
2060 DATA 230,75,166,75,224,8    :rem 152
2066 DATA 240,7,189,98,5,133     :rem 112
2072 DATA 59,208,208,173,0,3     :rem 97
2078 DATA 240,6,172,1,3,76       :rem 254
2084 DATA 14,5,169,255,141,0     :rem 96
2090 DATA 3,32,133,5,88,76       :rem 2
2096 DATA 69,217,2,34,66,98      :rem 70
2102 DATA 130,162,194,226,230,59 :rem 35
2108 DATA 160,0,177,59,141,0     :rem 91
2114 DATA 3,200,177,59,141,1     :rem 87
```

```
2120 DATA 3,32,186,5,32,133          :rem 35
2126 DATA 5,173,0,3,208,245          :rem 41
2132 DATA 96,160,0,185,0,3           :rem 245
2138 DATA 133,133,44,0,24,16         :rem 87
2144 DATA 251,169,16,141,0,24        :rem 140
2150 DATA 44,0,24,48,251,162         :rem 89
2156 DATA 4,169,0,6,133,42           :rem 251
2162 DATA 10,6,133,42,10,141         :rem 76
2168 DATA 0,24,202,208,240,72        :rem 138
2174 DATA 104,72,104,169,15,141      :rem 243
2180 DATA 0,24,200,208,206,96        :rem 138
2186 DATA 172,1,3,132,7,173          :rem 45
2192 DATA 0,3,197,6,8,133            :rem 205
2198 DATA 6,40,240,16,169,176        :rem 159
2204 DATA 133,0,88,36,0,48           :rem 250
2210 DATA 252,120,165,0,201,1        :rem 119
2216 DATA 208,78,169,238,141,12      :rem 0
2222 DATA 28,169,6,133,50,169        :rem 154
2228 DATA 0,133,51,133,48,169        :rem 148
2234 DATA 3,133,49,32,58,6           :rem 0
2240 DATA 80,254,184,173,1,28        :rem 148
2246 DATA 153,0,3,200,208,244        :rem 134
2252 DATA 160,186,80,254,184,173     :rem 50
2258 DATA 1,28,153,0,1,200           :rem 238
2264 DATA 208,244,32,224,248,165     :rem 47
2270 DATA 56,197,71,240,4,169        :rem 159
2276 DATA 34,208,20,32,233,245       :rem 194
2282 DATA 197,58,240,4,169,35        :rem 164
2288 DATA 208,9,169,236,141,12       :rem 209
2294 DATA 28,96,24,105,24,133        :rem 153
2300 DATA 68,169,255,141,0,3          :rem 94
2306 DATA 32,133,5,165,68,76         :rem 105
2312 DATA 200,193,32,64,6,76          :rem 95
2318 DATA 124,6,165,18,133,22        :rem 145
2324 DATA 165,19,133,23,165,6        :rem 149
2330 DATA 133,24,165,7,133,25        :rem 140
2336 DATA 169,0,69,22,69,23           :rem 59
2342 DATA 69,24,69,25,133,26         :rem 107
2348 DATA 32,52,249,162,90,32        :rem 153
2354 DATA 124,6,80,254,184,173       :rem 204
2360 DATA 1,28,217,36,0,208           :rem 41
2366 DATA 6,200,192,8,208,240        :rem 147
2372 DATA 96,202,208,233,169,32      :rem 254
2378 DATA 208,175,169,208,141,5        :rem 6
2384 DATA 24,169,33,44,5,24           :rem 54
2390 DATA 16,163,44,0,28,48           :rem 51
2396 DATA 246,173,1,28,184,160       :rem 208
2402 DATA 0,96,160,160,160,160       :rem 185
2408 DATA 160,160,160,160,160,160,160 :rem 78
2414 DATA 160,160,160,160,160,160    :rem 75
```

TELECOMPUTING TODAY

Arlan R. Levitan

Telecomputing To The Rescue

"I'm sorry, Mr. Levitan, your 7:45 flight to Las Vegas has been canceled."

Although I had arrived at the airport eager to take off for January's Consumer Electronics Show (CES as it is known in the trade), I was somewhat slow to reply. After standing in line at the ticket counter, I was too tired to respond with the appropriate level of indignation. All I could manage was a feeble "You've got to be kidding!"

"I wish I was, sir, but I'm afraid we couldn't muster a full crew for the flight. I'm sorry, but these things do happen once in a while."

I wearily resigned myself to a couple of hours hanging around Detroit Metro Airport and asked, "What time does the next direct flight leave?"

The countenance of what had seemed like a mild-mannered airline employee began to take on sinister undertones.

"I'm afraid that everything we have is booked," he said. "We can't confirm you all the way into Las Vegas at this time."

A note of hysteria crept into my voice. "Listen, I'll fly the plane. Honest, I do it all the time on weekends. My best friend owns a 747 and I'm qualified on everything up to the Space Shuttle."

Ignoring my generous offer to help the airline and the other 240 stranded travelers out of an unfortunate predicament, the agent's eyes started burning with nefarious fire as he chortled, "We'll fly you into Chicago on a flight leaving here in about three hours. From there we'll have to wait-list you on the only two flights we have from O'Hare to Las Vegas . . ."

I staggered backwards as if hit by a sharp blow to the solar plexus. In a momentary hallucination, I saw myself as the Lost Air Traveler, doomed to roam the corridors of O'Hare with a flight bag hanging 'round my neck.

Wait a minute! My flight bag had the answer. I raced over to a nearby pay phone and whipped out my trusty lap computer and the acoustic cups necessary to hook the unit's built-in modem to the nonmodular handset. I must have looked like a novelty juggling act as I attempted to keep all of my equipment from crashing to the floor. I dialed into the local number for one of the information services that I subscribe to and hooked into the electronic edition of OAG, the Official Airlines Guide (for more info on OAG see "Telecomputing Today," COMPUTE!, February 1985). In about two minutes I had the flight numbers and airlines for five other flights out of Detroit to Las Vegas. Disconnecting my computer from the phone, I started calling the airlines. On my second call I hit pay dirt—an opening on a flight to Phoenix, Arizona, connecting with a commuter flight to Las Vegas.

Armed with my new flight information, I boldly swaggered back to my nemesis's ticket position. "You may not be able to get me where I'm going, but another airline can. Just issue me an interrupted flight voucher for my canceled flight and I'll be on my way." Sheepishly, the agent completed the necessary paperwork. As I walked away to catch my new flight I glanced back over my shoulder in time to see a mass of angry ex-fellow passengers descending upon my defeated adversary.

New Lower-Priced Modems

So I finally did make it to the Winter CES and I return bearing glad tidings. This year will see the end of the Hayes price umbrella which has helped keep prices of intelligent 300 and 1200 bits-per-second (bps) modems rather high for the last 12 months or so.

Now, don't get me wrong—Hayes modems represented good value for the money at the time of their introduction. But recent developments in chip technology have made it possible to drastically reduce the number of components and amount of support circuitry required for modems. The problem is that modem manufacturers have tended to price their goods based more upon the going rate for market-leading Hayes modems than upon the actual manufacturing cost. With

COMPUTE! Back Issues

Here are some of the applications, tutorials, and games from available back issues of COMPUTE!. Each issue contains much, much more than there's space here to list, but here are some highlights:

Home and Educational COMPUTING! (Summer 1981 and Fall 1981—count as one back issue): Exploring The Rainbow Machine, VIC As Super Calculator, Custom Characters On The VIC, Alternative Screens, Automatic VIC Line Numbers, Using The Joystick (Spacewar Game), Fast VIC Tape Locater, Window, VIC Memory Map.

May 1981: Named GOSUB/GOTO in Applesoft, Generating Lower Case Text on Apple II, Copy Atari Screens to the Printer, Disk Directory Printer for Atari, Realtime Clock on Atari, PET BASIC Delete Utility, PET Calculated Bar Graphs, Running 40 Column Programs on a CBM 8032, A Fast Visible Memory Dump, Cassette Filing System, Getting To A Machine Language Program, Epidemic Simulation.

June 1981: Computer Using Educators (CUE) on Software Pricing, Apple II Hires Character Generator, Ever Expanding Apple Power, Color Burst for Atari, Mixing Atari Graphics Modes 0 and 8, Relocating PET BASIC Programs, An Assembler In BASIC for PET, Quadra PET: Multitasking?, Mapping Unknown Machine Language, RAM/ROM Memory, Keeping TABs on a Printer.

July 1981: Home Heating and Cooling, Animating Integer BASIC Lores Graphics, The Apple Hires Shape Writer, Adding a Voice Track to Atari Programs, Machine Language Atari Joystick Driver, Four Screen Utilities for the PET, Saving Machine Language Programs on PET Tape Headers, Commodore ROM Systems, Using TAB, SPC, And LEN.

August 1981: Minimize Code and Maximize Speed, Apple Disk Motor Control, A Cassette Tape Monitor for the Apple, Easy Reading of the Atari Joystick, Blockade Game for the Atari, Atari Sound Utility, The CBM "Fat 40," Keyword for PET, CBM/PET Loading, Chaining, and Overlaying, Adding A Programmable Sound Generator, Converting PET BASIC Programs To ASCII Files.

October 1981: Automatic DATA Statements for CBM and Atari, VIC News, Undeletable Lines on Apple, PET, and VIC; Budgeting on the Apple, Atari Cassette Boot-tapes, Atari Variable Name Utility, Atari Program Library, Train Your PET to Run VIC Programs, Interface a BSR Remote Control System to PET, A General Purpose BCD to Binary Routine, Converting to Fat-40 PET.

December 1981: Saving Fuel $$ (multiple computers), Unscramble Game (multiple computers), Maze Generator (multiple computers), Animating Applesoft Graphics, A Simple Atari Word Processor, Adding High Speed Vertical Positioning to Atari P/M Graphics, OSI Supercursor, A Look At SuperPET, Supermon for PET/CBM, PET Mine Maze Game, Replacing The INPUT # Command, Foreign Language Text on The Commodore Printer, File Recovery.

January 1982: Invest (multiple computers), Developing a Business Algorithm (multiple computers), Apple Addresses, Lowercase with Unmodified Apple, Cryptogram Game for Atari, Superfont: Design Special Character Sets on Atari, PET Repairs for the Amateur, Micromon for PET, Self-modifying Programs in PET BASIC, Tinymon: A VIC Monitor, VIC Color Tips, VIC Memory Map, ZAP: A VIC Game.

May 1982: VIC Meteor Maze Game, Atari Disk Drive Speed Check, Modifying Apple's Floating Point BASIC, Fast Sort For PET/CBM, Extra Atari Colors Through Artifacting, Life Insurance Estimator (multiple computers), PET Screen Input, Getting The Most Out Of VIC's 5000 Bytes.

August 1982: The New Wave Of Personal Computers, Household Budget Manager (multiple computers), Word Games (multiple computers), Color Computer Home Energy Monitor, A VIC Light Pen For Under $10, Guess That Animal (multiple computers), PET/CBM Inner BASIC, VIC Communications, Keyprint Compendium, Animation With Atari, VIC Curiosities, Atari Substring Search, PET and VIC Electric Eraser.

September 1982: Apple and Atari and the Sounds of TRON, Commodore Automatic Disk Boot, VIC Joysticks, Three Atari GTIA Articles, Commodore Disk Fixes, The Apple PILOT Language, Sprites and Sound on the Commodore 64, Peripheral Vision Exerciser (multiple computers), Banish INPUT Statements (multiple computers), Charades (multiple computers), PET Pointer Sort, VIC Pause, Mapping Machine Language, Commodore User-defined Functions Defined, A VIC Bug.

January 1983: Sound Synthesis And The Personal Computer, Juggler And Thunderbird Games (multiple computers), Music And Sound Programs (multiple computers), Writing Transportable BASIC, Home Energy Calculator (multiple computers), All About Commodore WAIT, Supermon 64, Perfect Commodore INPUTs, VIC Sound Generator, Copy VIC Disk Files, Commodore 64 Architecture.

May 1983: The New Low-Cost Printer/Plotters, Jumping Jack (multiple computers), Deflector (multiple computers), VIC Kaleidoscope, Graphics on the Sinclair/Timex,

COMPUTE! Back Issues

Bootmaker For VIC, PET and 64, VICSTATION: A "Paperless Office," The Atari Musician, Puzzle Generator (multiple computers), Instant 64 Art, 64 Odds And Ends, Versatile VIC Data Acquisition, POP For Commodore.

June 1983: How To Buy The Right Printer, The New, Low-Cost Printers, Astrostorm (multiple computers), The Hawkmen Of Dindrin (multiple computers), MusicMaster For The Commodore 64, Commodore Data Searcher, Atari Player/Missile Graphics Simplified, VIC Power Spirals, UnNEW For The VIC and 64, Atari Fast Shuffle, VIC Contractor, Commodore Supermon Q & A.

July 1983: Constructing The Ideal Computer Game, Techniques For Writing Your Own Adventure Game, SpeedSki And Time Bomb (VIC), Castle Quest And Roadblock (Atari), RATS! And Goblin (64), How To Create A Data Filing System (multiple computers), How To Back Up Disks For VIC And 64, Atari Artifacting, All About The Commodore USR Command, TI Mailing List.

August 1983: Weather Forecaster (multiple computers), First Math And Clues (multiple computers), Converting VIC And 64 Programs To PET, Atari Verify, Apple Bytechanger, VIC And 64 Escape Key, Banish Atari INPUT Statements, Mixing Graphics Modes On The 64, VICplot, VIC/64 Translations: Reading The Keyboard, Musical Atari Keyboard, VIC Display Messages.

September 1983: Games That Teach, Caves Of Ice, Diamond Drop, Mystery Spell, and Dots (multiple computers), VIC Pilot, Ultrasort (VIC, 64, PET), Easy Atari Page Flipping, Computer Aided Design On The TI, Relative Files On the VIC/64, Atari Fontbyter, TI Sprite Editor, All About Interrupts (multiple computers), Cracking The 64 Kernal, Making Change On The Timex/Sinclair, Build Your Own Random File Manager (multiple computers).

October 1983: Computer Games By Phone, Coupon File (multiple computers), Dragon Master And Moving Maze (multiple computers), Merging Programs From Commodore Disks, Atari Master Disk Directory, Sprites In TI Extended BASIC, Commodore EXEC, Multicolor Atari Character Editor, High Speed Commodore Mazer, Apple Sounds, Extra Instructions (multiple computers), Commodore DOS Wedges, Invisible Disk Directory For VIC And 64.

February 1984: What Makes A Good Game, Circus (multiple computers), Quatrainment (multiple computers), Commodore 3-D Drawing Master (Apple version also included), Speedy BASIC For VIC And 64, Dr. Video 64.

March 1984: All About Adding Peripherals, Modern Memory: The Future Of Storage Devices, Roader (multiple computers), Barrier Battle (multiple computers), Programming The TI: File Processing, Sound Shaper (multiple computers), Commodore Floating Subroutines, Big Buffer For Atari.

April 1984: Apple's Macintosh Unveiled, Securities Analysis (multiple computers), Worm Of Bemer (multiple computers), Programming The TI: File Processing, Part 2, 1540/1541 Disk Housekeeping, Hidden Atari DOS Commands, Function Keys For The Apple, TI Tricks And Tips, Super Directory (multiple computers).

May 1984: The Digital Palette: Fundamentals Of Computer Graphics, The Inside Story: How Graphics Tablets And Light Pens Work, Picture Perfect For Atari And Commodore 64, 64 Hi-Res Graphics Editor, Snertle (multiple computers), Pentominos: A Puzzle-Solving Program (multiple computers), A BASIC Cross-Reference (PET, 64).

June 1984: Choosing The Right Printer: The Easy Way To Hard Copy, Pests (multiple computers), Olympiad (multiple computers), Programming The TI: TI Graphics, MacroDOS For Atari, Part 1, Apple Variable Save, Programming 64 Sound, Part 1, Apple Input And Menu Screens.

July 1984: Evolutionary To The Core: The Apple IIc Heads For Home, The ABC's Of Data Bases, Statistics For Nonstatisticians (multiple computers), Bunny Hop (multiple computers), Blueberries (multiple computers), Atari Artist, Applesoft Lister, Program Conversion With Sinclair BASIC And TI BASIC, Commodore 64 ROM Generations.

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the introduction in 1985 of mass-produced low chip-count modems from companies like Panasonic, Atari, and Commodore, telecomputing at 300 and 1200 bps speeds will be more affordable than ever before.

Consider Panasonic's new line of modems. Models KX-D401 and KX-D402 are 300 bps and 300/1200 bps units, respectively. Both have originate, answer, and autoanswer modes with LED indicators for data, carrier detect, autoanswer, and power. Prices? The KX-D401 retails for $99.95, the KX-D402 for $299.95.

How about a Panasonic phone with built-in modem? The KX-D4130 has all the features of the KX-D401 modem and sports a 24-button automatic dialer that can store up to 30 digits per number. An auto-redial function will redial busy numbers 15 times every ten minutes.

The icing on the cake is an integral hands-free speakerphone with excellent audio clarity. At $199.95, the KX-D4130 is sure to be a favorite of gadget-happy telecomputing aficionados. All of the new Panasonics can be used with any computer equipped with an RS-232 interface.

Atari & Commodore Surprises

The price of telecomputing on Atari systems takes a dive with the introduction of the Atari XM-301 300 bps direct-connect modem. At $49.95 it's one of the least expensive autoanswer, autodial modems around. Since the compact unit draws its power from the Atari serial bus connector, no separate power supply is required. Also announced at CES was a new telecomputing software cartridge dubbed *The Learning Phone*, which will allow Atari systems equipped with modems to access Control Data Corporation's vaunted PLATO educational system, complete with high-resolution graphics. Estimated price of the new cartridge is in the $30–$40 range.

Micro Peripheral Products of Albany, Oregon, announced a price cut of $50 on its Model 1000C modem for Atari computers (now $149.95) and introduced the MPP 1064, a new direct-connect modem for the Commodore 64. The price is $99.95, which includes a sophisticated smart terminal program.

Commodore's new palm-sized 1660 Modem 300 is a direct-connect 300 bps unit with autoanswer, autodial, and a built-in speaker for monitoring the progress of calls. The 1660 plugs directly into the user ports of the Commodore 64, Plus/4, or new Commodore 128 computer. At only $29.95, it will hardly make a dent in even the most frugal Commodore owner's pocket.

If that pricing doesn't seem predatory, consider the Commodore 1670 Modem/1200, a 1200 bps twin to the 1660. Slated for introduction three months or so after the introduction of its little brother, the 1670 is likely to set the modem market on its ear. I was able to inspect the innards of the 1670 at an after-hours conclave during CES and counted only three chips and a couple dozen small resistors on the modem's 2 × 4-inch circuit board. The low component count should contribute to relatively high reliability. The board and chips still bore the markings of the manufacturer which designed the unit—U.S. Robotics, an experienced and well-respected vendor of telecomputing products. Commodore will manufacture both the 1660 and 1670 internally to keep costs down.

The price? If only one mildly euphoric Commodore employee had mentioned a number below $100, I might have dismissed it out of hand. To my surprise, the figure was seconded by another source the following day. Looks like Commodore owners may have the telecomputing bargain of the year on their hands by summer's end!

And More Good News

Commodore's new 32K LCD lap computer was the hit of the show for most journalists already accustomed to lugging around TRS-80 Model 100s or Olivetti M10s. The modem-equipped Commodore's 80-column by 16-line screen is the fastest and most legible LCD screen I've seen to date. Priced at $600 or less, the Commodore lap portable may cause Tandy to rethink the thousand-dollar price of its new 24K Model 200 lap computer, whose 40 × 16 LCD screen pales in comparison.

Racing to beat the band, General Videotex Corporation announced at CES that its Delphi information service now supports high-speed 2400 bps access in 34 major cities. The additional cost to Delphi subscribers for the higher access rate is a $5/hour surcharge over the normal Delphi rates of $16/hour during business hours and $6/hour nonprime time for both 300 and 1200 bps access. Watch for the previously low-key service to start making noises like a contender—new personnel that GVC has picked up in raids on CompuServe's staff will begin making major changes in the services offered.

Enough news for now. Next month we'll cover the ins and outs of transferring information to and from a remote computer with your own system. Stay tuned for chapter 1 of the "Compleat Uploader & Downloader."

Till then, BCNU.

Arlan R. Levitan
Delphi: ARLANL
The Source: TCT987
CompuServe: 70675,463

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SpeedScript 3.0

All Machine Language Word Processor For Expanded VIC-20

Charles Bronnon, Program Editor

COMPUTE! *continues its* SpeedScript 3.0 *series this month with our enhanced version for the Commodore VIC-20 (with at least 8K memory expansion). Written entirely in machine language,* SpeedScript *contains nearly every command and convenience you'd expect from a quality word processor. First introduced in the January 1984 issue of our companion magazine,* COMPUTE!'s GAZETTE, SpeedScript *incorporates a year's worth of improvements, readers' suggestions, and additional debugging. Because the VIC version is so similar to the Commodore 64 version, refer to last month's article for a full tutorial-style explanation. This month's article is an abbreviated description. Look for the Atari and Apple versions of* SpeedScript 3.0 *in coming issues.*

SpeedScript 3.0, though compact in size (6K), has many features found on commercial word processors. *SpeedScript* is also very easy to learn and use. You type in everything first; preview and make corrections on the screen; insert and delete words, sentences, and paragraphs; then print out an error-free draft, letting *SpeedScript* take care of things like margins, centering, headers, and footers.

Entering *SpeedScript*

SpeedScript is one of the longest machine language programs we've ever published, but the MLX entry system helps you type it right the first time. MLX can detect most errors people make when entering numbers. (See the MLX article elsewhere in this issue.) MLX also lets you type *SpeedScript* in more than one sitting. (Unfortunately, if you have an earlier version of *SpeedScript,* you cannot just make certain changes to bring it up to version 3.0. You have to type it from scratch.) Although the program listing is lengthy, we guarantee the effort will be worthwhile.

Before you begin typing *SpeedScript* (or begin a subsequent session of typing if you enter *SpeedScript* in more than one sitting), you must enter the following POKEs *before* you load and run the MLX program. These POKEs are essential to protect *SpeedScript* from BASIC while you are typing it in. Again, these POKEs should be performed *before* you load MLX, but are not necessary to run the finished *SpeedScript* program:

```
POKE 44,42:POKE 10752,0:NEW
```

Now load and run the VIC version of MLX (remember that you need at least 8K memory expansion to run VIC MLX). Answer the first two questions like this:

```
Starting Address? 4609
Ending Address? 10482
```

The screen will then show the first prompt, the number 4609 followed by a colon. Type in each three-digit number shown in the listing. You do not need to type the comma shown in the listing. MLX inserts the comma automatically.

The last number you enter in each line is a *checksum.* It represents the values of the other numbers in the line summed together. If you make a mistake while entering the line, the checksum calculated by MLX and displayed on the screen should not match that of the listing, and you will have to retype the line. MLX is not foolproof, though. It's possible to fool the checksum by exchanging the position of the three-digit numbers. Also, an error in one number can be offset by an error in another (just as 3 + 4 + 7 = 1 + 4 + 9). Keep this in mind. MLX will help catch your errors, but you still must be careful.

Typing In Multiple Sittings

If you want to stop typing the listing at some point and pick up later, press SHIFT-S and follow the screen prompts. Remember to note the line number of the last line you typed in. When you are ready to continue typing, enter the POKEs mentioned above, load MLX, answer the starting and ending address prompts, then press SHIFT-L. MLX asks for the filename you gave to the partially typed program. After the LOAD is complete, press SHIFT-N and tell MLX the line number you stopped at. Now continue typing as before. When you finish all typing, MLX automatically prompts you to save the program.

At this point MLX has saved a program file on tape or disk. If you load it and list it, you'll see that it looks like a normal one-line BASIC program, with a line number and a SYS command. The machine language program that is *SpeedScript* starts in memory just after the SYS command. The simulated BASIC line is included so you can load *SpeedScript* like any BASIC program and enter RUN to start it. You don't need to add the ",1" like you do when loading many machine language programs. Just LOAD "SPEEDSCRIPT" (or whatever filename you called it) for tape, or LOAD "SPEEDSCRIPT",8 for disk, then enter RUN. Once *SpeedScript* is in memory, you can save it from BASIC like a BASIC program. If *SpeedScript* is running, press RUN/STOP–RESTORE to exit to BASIC.

Before using *SpeedScript,* you should generally unplug all cartridges such as the *Super Expander.* You must have a memory expansion cartridge plugged in that

provides at least an additional 8K, although *SpeedScript* can take advantage of up to 24K of memory. *SpeedScript* cannot take advantage of any custom hardware configurations except those that do not interfere with normal operations.

Entering Text

When you run *SpeedScript*, the screen colors change to black on white. The first two lines on the screen are black with white letters. *SpeedScript* presents all messages on these *command lines*. The remaining 21 lines of the screen are used to enter, edit, and display your document. The cursor shows where the next character you type will appear on the screen. *SpeedScript* lets you move the cursor anywhere within your document, making it easy to find and correct errors.

To begin using *SpeedScript*, just start typing. When the cursor reaches the right edge of the screen, it automatically jumps to the beginning of the next line, just as in BASIC. But unlike BASIC, *SpeedScript* never splits words at the right edge of the screen. If a word you're typing won't fit at the end of one line, it's instantly moved to the next line. This feature, called *word wrap* or sometimes *parsing*, makes it much easier to read your text on the screen.

Scrolling And Screen Formatting

When you finish typing on the last screen line, *SpeedScript* automatically scrolls the text upward to make room for a new line at the bottom. Imagine the screen as a 21-line window on a long continuous document. In total, there's room for 3072 characters of text with an 8K expander; up to 19,456 with a 24K expander. To check at any time how much space is left, press **CTRL-=** (hold down the CTRL key while pressing the = key). The number which appears in the command line indicates how much room remains for characters of text.

If you're used to a typewriter, you'll have to unlearn some habits. Since the screen is only 22 columns wide, and most printers have 80-column carriages, it doesn't make sense to press RETURN at the end of each line as you do on a typewriter. *SpeedScript*'s word wrap takes care of this automatically. Press RETURN only when you want to force a carriage return to end a paragraph or limit the length of a line. A *return-mark* appears on the screen as a left-pointing arrow.

Using The Keyboard

Most features are accessed with control-key commands—you hold down CTRL while pressing another key. In this article, control-key commands are abbreviated **CTRL-*x*** (where *x* is the key you press in combination with CTRL). An example is the CTRL-= mentioned above to check on free memory. CTRL-E means hold down CTRL and press E. Sometimes you have to hold down both SHIFT and CTRL as you type the command key, as in SHIFT-CTRL-H. Other keys are referenced by name or function, such as *back-arrow* for the left-pointing arrow in the top-left corner of the keyboard, *pound sign* for the British pound sign (£), CLR/HOME for the home cursor key, SHIFT–CLR/HOME for the clear screen key, f1 for special function key 1, and *up-arrow* for the upward-pointing arrow to the left of the RESTORE key. See Figure 1 for a complete quick-reference chart of all keyboard commands.

Some keys let you move the cursor to different places in the document to make corrections or scroll text into view. You can move the cursor by character, word, sentence, or paragraph. Here's how to control the cursor:

- The **left/right cursor key** works as usual; pressing this key by itself moves the cursor right (forward) one space, and pressing it with SHIFT moves the cursor left (backward) one space.
- The **up/down cursor key** moves the cursor forward to the beginning of the next sentence. Pressing it with SHIFT moves the cursor backward to the beginning of the previous sentence.
- The **f1 special function key** moves the cursor forward to the beginning of the next word. The **f2 key** (hold down SHIFT and press f1) moves the cursor backward to the beginning of the previous word.
- The **f3 special function key** moves the cursor forward to the beginning of the next sentence (just like the up/down cursor key). The **f4 key** (hold down SHIFT and press f3) moves the cursor backward to the beginning of the previous sentence (just like pressing SHIFT and the up/down cursor key).
- The **f5 special function key** moves the cursor forward to the beginning of the next paragraph. The **f6 key** (hold down SHIFT and press f5) moves the cursor backward to the beginning of the previous paragraph.
- The **CLR/HOME key,** pressed once by itself, moves the cursor to the top of the screen without scrolling. Pressed twice, it moves the cursor to the beginning of the document.
- **CTRL-Z** moves the cursor to the bottom of the document.

Correcting Your Typing

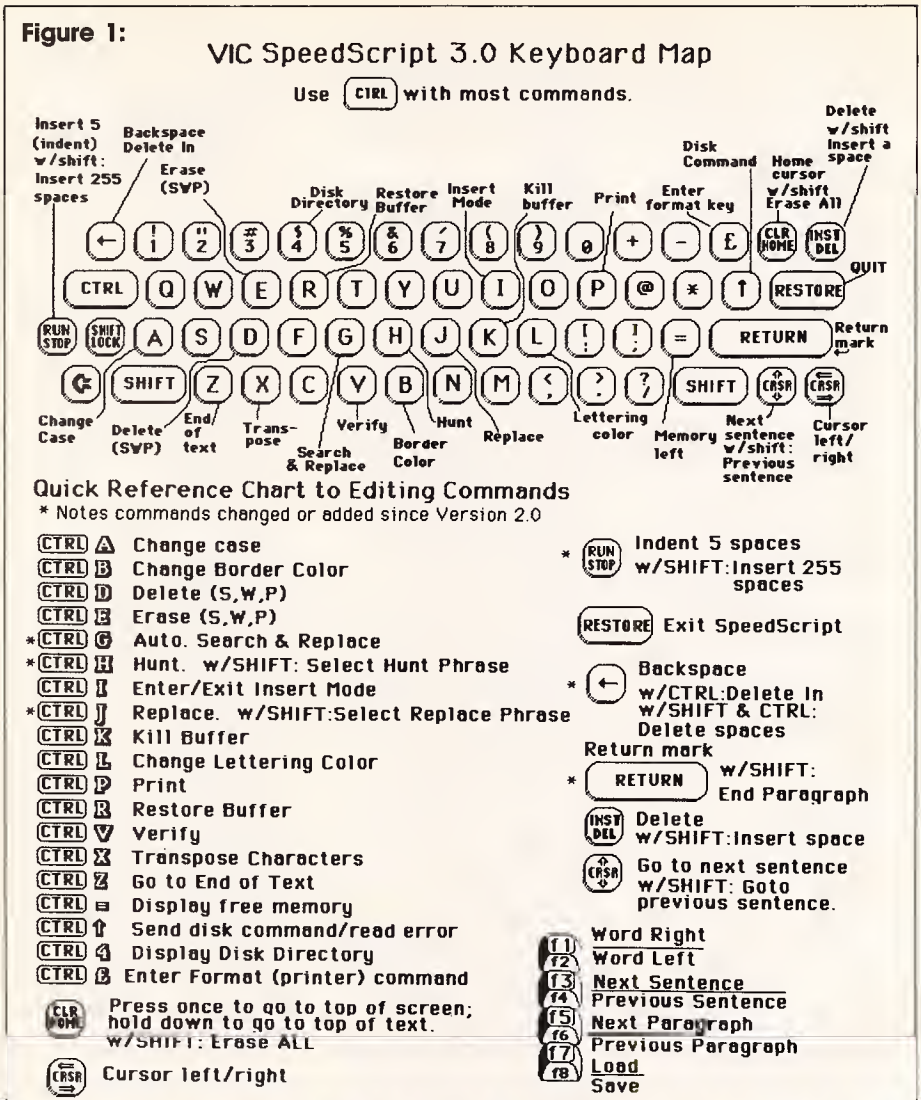
Sometimes you'll have to insert some characters to make a correction. Use **SHIFT-INST/DEL** to open up a single space, just as in BASIC. Merely position the cursor at the point where you want to insert a space, and press SHIFT–INST/DEL.

It can be tedious to use the SHIFT–INST/DEL key to open up enough space for a whole sentence or paragraph. For convenience, *SpeedScript* has an insert mode that automatically inserts space for each character you type. In this mode, you can't type over characters; everything is inserted at the cursor position. To enter insert mode, press **CTRL-I.** To cancel insert mode, press CTRL-I again. To let you know you're in insert mode, the normally black command lines at the top of the screen turn blue.

Insert mode is the easiest way to insert text, but it can become too slow when working with a very long document because it must move *all* the text following the cursor position. So *SpeedScript* has even more ways to insert blocks of text.

One way is to use the **RUN/STOP** key. It is programmed in *SpeedScript* to act as a five-space margin indent. To end a paragraph and start another, press

Figure 1:



Quick Reference Chart to Editing Commands

* Notes commands changed or added since Version 2.0

CTRL A Change case
CTRL B Change Border Color
CTRL D Delete (S,W,P)
CTRL E Erase (S,W,P)
*CTRL G Auto. Search & Replace
*CTRL H Hunt. w/SHIFT: Select Hunt Phrase
CTRL I Enter/Exit Insert Mode
*CTRL J Replace. w/SHIFT:Select Replace Phrase
CTRL K Kill Buffer
CTRL L Change Lettering Color
CTRL P Print
CTRL R Restore Buffer
CTRL V Verify
CTRL X Transpose Characters
CTRL Z Go to End of Text
CTRL = Display free memory
CTRL ↑ Send disk command/read error
CTRL 4 Display Disk Directory
CTRL 8 Enter Format (printer) command

CLR HOME Press once to go to top of screen; hold down to go to top of text. w/SHIFT: Erase ALL

CRSR Cursor left/right

* RUN STOP Indent 5 spaces w/SHIFT:Insert 255 spaces

RESTORE Exit SpeedScript

* ← Backspace w/CTRL:Delete In w/SHIFT & CTRL: Delete spaces

* RETURN Return mark w/SHIFT: End Paragraph

INST DEL Delete w/SHIFT:Insert space

CRSR Go to next sentence w/SHIFT: Goto previous sentence.

f1 Word Right
f2 Word Left
f3 Next Sentence
f4 Previous Sentence
f5 Next Paragraph
f6 Previous Paragraph
f7 Load
f8 Save

RETURN twice and press RUN/STOP. You can use RUN/STOP to open up more space than SHIFT–INST/DEL. No matter how much space you want to insert, each insertion takes the same amount of time. So the RUN/STOP key can insert five spaces five times faster than pressing SHIFT–INST/DEL five times.

There's an even better way, though. Press **SHIFT–RUN/STOP** to insert 255 spaces. You can press it several times to open up as much space as you need. And SHIFT–RUN/STOP is *fast*. (You don't want to be in insert mode when you use this trick; that would defeat its purpose.)

Since the INST/DEL key also is slow when working with large documents (it, too, must move all text following the cursor), you may prefer to use the back-arrow key to

backspace. The back-arrow key by itself moves the cursor left one space and blanks out that position. It's more like a backspace than a delete.

After you're done inserting with these methods, there will probably be some inserted spaces left over that you didn't use. Just press **SHIFT-CTRL-back arrow.** This instantly deletes all extra spaces between the cursor and the start of following text.

Erasing Text

Press the **INST/DEL key** by itself to erase the character to the left of the cursor. All the following text is pulled back to fill the vacant space.

Press **CTRL-back arrow** to delete the character on which the cursor is sitting. Again, all the following text is moved toward the cursor to fill the empty space.

These keys are fine for minor deletions, but it could take all day to delete a whole paragraph this way. So *SpeedScript* has two commands that can delete an entire word, sentence, or paragraph at a time. **CTRL-E** erases text *after* (to the right of) the cursor position, and **CTRL-D** deletes text *behind* (to the left of) the cursor.

To use the **CTRL-E erase mode,** first place the cursor at the beginning of the word, sentence, or paragraph you want to erase. Then press CTRL-E. The command line shows the message "Erase (S,W,P): RETURN to exit." Press S to erase a sentence, W for a word, or P for a paragraph. Each time you press one of these letters, the text is quickly erased. You can keep pressing S, W, or P until you've erased all the text you wish. Then press RETURN to exit the erase mode.

The **CTRL-D delete mode** works similarly, but deletes only one word, sentence, or paragraph at a time. First place the cursor after the word, sentence, or paragraph you want to delete. Then press CTRL-D. Next, press S, W, or P for sentence, word, or paragraph. The text is immediately deleted and you return to editing. You don't need to press RETURN to exit the CTRL-D delete mode unless you pressed this key by mistake. *(In general, you can escape from any command in* SpeedScript *by simply pressing RETURN.)* CTRL-D is most convenient when the cursor is already past what you've been typing.

Figure 2: Quick Reference Chart
Format (Printer) Commands
Enter with CTRL-£

Command	Description	Default
a	True ASCII	off
b	Bottom Margin	58
c	Centering	
e	Edge Right	
f	Footer	
g	Goto Linked File*	
h	Header	
i	Information*	
j	Select linefeeds*	
l	Left Margin	5
m	Margin Release*	
n	Next Page	
p	Page Length*	66
r	Right Margin	75
s	Spacing	1
t	Top Margin	5
u	Underline toggle	
w	Page Wait	
x	Columns across*	80
@	Initial page #*	1
?	Skip pages*	
#	Print page number	

hc SpeedScript/#← Centered Header with page number

l10r70s2← Left margin 10, right margin 70, double spacing.

g0:SpeedScript.2← Goto and continue printing with filename "SpeedScript.2"

* Notes command changed or added since Version 2.0

The Text Buffer

When you erase or delete with CTRL-E and CTRL-D, the text isn't lost forever. *SpeedScript* remembers what you've removed by storing deletions in a separate area of memory called a *buffer.* The buffer is a fail-safe device. If you erase too much, or change your mind, just press **CTRL-R** to restore the deletion. However, be aware that *SpeedScript* remembers only the last erase or delete you performed.

Another, more powerful, use of this buffer is to move or copy sections of text. To move some text from one location in your document to another, first erase or delete it with CTRL-E or CTRL-D. Then move the cursor to where you want the text to appear and press CTRL-R. CTRL-R instantly inserts the contents of the buffer at the cursor position. If you want to copy some text from one part of your document to another, just erase or delete it with CTRL-E or CTRL-D, restore it at the original position with CTRL-R, then move the cursor elsewhere and press CTRL-R to restore it again. You can retrieve the buffer with CTRL-R as many times as you like.

Important: The CTRL-E erase mode lets you erase up to the maximum size of the buffer (1K, or 1024 characters), and CTRL-E also removes the previous contents of the buffer. Keep this in mind if there's something in the buffer you'd rather keep. If you don't want the buffer to be erased, press **SHIFT-CTRL-E.** This preserves the buffer contents and adds newly erased text to the buffer.

If you ever need to erase the contents of the buffer, press **CTRL-K** (*kill buffer*).

The Wastebasket Command

If you want to start a new document, or simply obliterate all your text, press **SHIFT-CLR/HOME**. *SpeedScript* asks, "ERASE ALL: Sure? Y/N." This is your last chance. If you *don't* want to erase the entire document, press N or any other key. Press Y to perform the irreversible deed. There is no way to recover text wiped out with Erase All.

If you press RUN/STOP–RESTORE, you'll find yourself back to BASIC's READY prompt. Once in BASIC you still have one chance to reenter *SpeedScript* without losing your text—simply enter RUN (but your chances decrease if you execute other commands in BASIC).

Search And Replace

SpeedScript has a Hunt command that searches through your document to find a selected word or phrase. A Replace option lets you automatically change one word to another throughout the document.

SHIFT-CTRL-H activates the Hunt feature, **SHIFT-CTRL-J** (J is used because it's next to the H) lets you selectively hunt and replace, and **CTRL-G** (also next to the H) is for automatically searching and replacing.

Searching is a two-step process. First you need to tell *SpeedScript* what to search for, then you trigger the actual search. Press SHIFT-CTRL-H. The command lines say "Hunt for:". Type in what you'd like to search for, the *search phrase*. If you press RETURN alone without typing anything, the Hunt command is canceled.

When you are ready to search, press **CTRL-H**. *SpeedScript* looks for the next occurrence of the search phrase *starting from the current cursor position*. If you want to hunt through the entire document, press CLR/HOME twice to move the cursor to the very top before beginning the search. Each time you press CTRL-H, *SpeedScript* looks for the next occurrence of the search phrase and places the cursor at the start of the phrase. If the search fails, you'll see the message "Not Found."

CTRL-J (Replace) works together with CTRL-H. After you've specified the search phrase with SHIFT-CTRL-H, press **SHIFT-CTRL-J** to select the replace phrase. (You can press RETURN alone at the "Replace with:" prompt to select a *null* replace phrase. When you hunt and replace, this deletes the located phrase.) To manually search and replace, start by pressing CTRL-H. After *SpeedScript* finds the search phrase, press CTRL-J if you want to replace the phrase. If you don't want to replace the phrase, don't press CTRL-J. You are not in a special search and replace mode. You're free to continue writing at any time.

CTRL-G links CTRL-H and CTRL-J together. It first asks "Hunt for:", then "Replace with:", then automatically searches and replaces throughout the document starting at the cursor position.

Storing Your Document

Just press f8 (SHIFT-f7) to store a document. You'll see the prompt "Save:". Type in a filename up to 16 characters long, but do not use question marks or asterisks. You cannot use the same name for two different documents on a single disk. To replace a document already on disk using the same filename, precede your filename with the characters **@0:** or **@:**. You can also precede the filename with either **0:** or **1:** if you use a dual disk drive. *SpeedScript* cannot access a second disk drive with a device number of 9.

After entering the filename, answer the prompt "Tape or Disk" by pressing either the **T** or **D** key. You can cancel the SAVE command by pressing RETURN without typing anything else at either the "Save:" or "Tape or Disk?" prompt.

When the SAVE is complete, *SpeedScript* reports "No errors" if all is well, or reads and reports the disk error message if not. It is not possible to detect errors during a tape SAVE, so if you want peace of mind, use the Verify command. Rewind the tape, press **CTRL-V**, then type the filename. Press T for tape, then press PLAY on the recorder. *SpeedScript* compares the file on tape with that in memory and reports "No errors" if the verify succeeds, or "Verify Error" if not. You can also verify disk files.

Loading A Document

To recall a previously saved document, press **f7**. Answer the "Load:" prompt with the filename. Insert the tape or disk, rewind the tape, then answer T or D. Press PLAY on tape. *SpeedScript* loads the file and should display "No errors." Otherwise, *SpeedScript* reads the error channel of the disk drive or simply reports "Load error" for tape.

The position of the cursor is important before loading a file. *SpeedScript* starts loading at the cursor position, so be sure to press CLR/HOME twice or SHIFT–CLR/HOME (Erase All) to move the cursor to the start of text space, unless you want to merge two documents. When you press f7 to load, the command lines turn green to warn you if the cursor is not at the top of the text space.

To merge two or more files, simply load the first file, press CTRL-Z to move the cursor to the end of the document, and then load the file you want to merge. Do not place the cursor somewhere in the middle of your document before loading. A LOAD does not insert the text from tape or disk, but overwrites all text after the cursor position. The last character loaded becomes the new end-of-text pointer, and you cannot access any text that appears ahead of this pointer.

Disk Commands

Sometimes you forget the name of a file, or need to scratch or rename a file. *SpeedScript* gives you full control over the disk drive. Just press **CTRL-up arrow**, then type in a 1541 disk command. You don't need to type PRINT#15 as you do in BASIC, just the actual command. If you press RETURN without typing a disk command, *SpeedScript* displays the disk status. It also displays the status after completing a disk command.

Additional Features

SpeedScript has a few commands that don't do much, but are nice to have. **CTRL-X** exchanges the character under the cursor with the character to the right of the cursor. Thus you can fix transposition er-

rors with a single keystroke. **CTRL-A** changes the character under the cursor from uppercase to lowercase or vice versa.

Press **CTRL-B** to change the background and border colors. Each time you press CTRL-B, one of 16 different background colors appears. Press **CTRL-L** to cycle between the eight character (lettering) colors. The colors are preserved until you change them. If you resave *SpeedScript* from BASIC as described above, the program will load and run with your color choice in the future.

PRINT!

To begin printing, simply press **CTRL-P.** If your printer is attached, powered on, and selected (online), *SpeedScript* begins printing immediately. To cancel printing, hold down the **RUN/STOP** key until printing stops, then release it when the border color changes to white. *SpeedScript* assumes a left margin of five, a right margin of 75, single-spacing, and continuous-feed paper. You can change these default settings if you want (see below).

Before printing, be sure the paper in your printer is adjusted to top-of-form (move the paper perforation just above the printing element). CTRL-P assumes a Commodore printer, so it's helpful if your interface simulates the modes and codes of the Commodore 1525, MPS-801, or 1526 printer. CTRL-P prints with a device number of 4 and a secondary address of 7 (uppercase/lowercase mode).

If CTRL-P doesn't work for you, try another variation, **SHIFT-CTRL-P.** Answer the prompt "Print to: Screen, Disk, Printer?" with the single letter **S**, **D**, or **P**. Press any other key to cancel the command.

If you press P for printer, *SpeedScript* requests two more keystrokes. First answer "Device number" with a number from 4 to 7. This lets you print to one of several printers addressed with different device numbers. Next answer "Secondary Address?" with a number from 0 to 9.

Printing To Screen And Disk

SHIFT-CTRL-P prints to the screen when you press S. The screen colors change to white letters on a black background, and what appears on the screen is exactly what would print on the printer. It takes about four screen lines to hold one 80-column printed line, of course. If you use double-spacing (see below), it's much easier to see how each line is printed. With this screen preview, you can see where lines and pages break. To freeze printing, hold down either SHIFT key or engage SHIFT LOCK. When printing is finished, press any key to return to editing.

SHIFT-CTRL-P prints to a disk file when you press D. Enter the filename when requested. *SpeedScript* sends out all printer information to a sequential file. You can use other programs to process this formatted file (see last month's *SpeedScript* article for details).

Formatting Commands

The print-formatting commands must be distinguished from normal text, so they appear onscreen in reverse field with the text and background colors switched. You enter these reverse-field letters by pressing **CTRL-£** (pound sign). Answer the prompt "Enter format key:" by pressing a single key. This key is inserted into text in reverse-field. All lettered printer commands should be entered in lowercase (unSHIFTed). During printing, *SpeedScript* treats these characters as printing commands.

There are two kinds of printing commands, which we'll call Stage 1 and Stage 2. Stage 1 commands usually control variables such as left margin and right margin. Most are followed by a number, with no space between the command and the number. Stage 1 commands are executed before a line is printed.

Stage 2 commands, like centering and underlining, are executed while the line is being printed. Usually Stage 1 commands must be on a line of their own, although you can group several Stage 1 commands together on a line. Stage 2 commands are by nature embedded within a line of text.

Stage 1 Commands

l Left margin. Follow with a number from 0 to 255. Use 0 for no margin. Defaults to 5.

r Right margin position, a number from 1 to 255. Defaults to 75. Be sure the right margin value is greater than the left margin value, or *SpeedScript* will go bonkers.

t Top margin. The position at which the first line of text is printed, relative to the top of the page. Defaults to 5. The header (if any) is always printed on the first line of the page, before the first line of text.

b Bottom margin. The line at which printing stops before continuing to the next page. Standard 8½ × 11-inch paper has 66 lines. Bottom margin defaults to the fifty-eighth line. The footer (if any) is always printed on the last line of the page, after the last line of text.

p Page length. Defaults to 66. If your printer does not print six lines per inch, multiply lines-per-inch by 11 to get the page length. European paper is usually longer than American paper—11⅝ or 12 inches. Try a page length of 69 or 72.

s Spacing. Defaults to single-spacing. Follow with a number from 1 to 255. Use 1 for single-spacing, 2 for double-spacing, 3 for triple-spacing.

@ Start numbering *at* page number given. Page numbering normally starts with 1.

? Disables printing until selected page number is reached. For example, a value of 3 would start printing the third page of your document. Normally, *SpeedScript* prints starting with the first page.

x Sets the page width, in columns (think *a cross*). Defaults to 80. You need to change this for the sake of the centering command if you are printing in double-width or condensed type, or are using a 40-column or wide-carriage printer.

n Forced paging. Normally, *SpeedScript* prints the footer and moves on to the next page only when it has finished a page, but you can force it to continue to the next page by issuing this command. It requires no numbers.

m Margin release. Disables the left margin for the next printed line. Remember that this executes before the line is printed. It's used for outdenting.

a True ASCII. Every character is assigned a number in the ASCII

(American Standard Code for Information Interchange) character set. Most printers use this true ASCII standard, but Commodore printers exchange the values for uppercase and lowercase to match Commodore's own variation of ASCII. Some printer interfaces do not translate Commodore ASCII into true ASCII, so you need to use this command to tell *SpeedScript* to translate. Also, you will sometimes want to intentionally disable your interface's emulation mode in order to control special printer features that would otherwise be rejected by emulation. Place this command as the first character in your document, even before the header and footer definitions. Don't follow it with a number.

w Page wait. Like the true ASCII command, this one should be placed at the beginning of your document before any text. With page wait turned on, *SpeedScript* prompts you to "Insert next sheet, press RETURN" when each page is finished printing. Insert the next sheet, line it up with the printhead, then press RETURN to continue. Page wait is ignored during disk or screen output.

j Select automatic linefeeds after carriage return. Like **a** and **w**, this command must be placed before any text. Don't use this command to achieve double-spacing, but only if all text prints on the same line.

i Information. This works like REM in BASIC. You follow the command with a line of text, up to 255 characters, ending in a return-mark. This line will be ignored during printing, and is handy for making notes to yourself such as the filename of the document.

h Header define and enable. The header must be a single line of text (up to 254 characters) ending in a return-mark. The header prints on the first line of each page. You can include Stage 2 commands such as centering and page numbering in a header. You can use a header by itself without a footer. The header and footer should be defined at the top of your document, before any text. If you want to prevent the header from printing on the first page, put a return-mark by itself at the top of your document before the header definition.

f Footer define and enable. The footer must be a single line of text (up to 254 characters) ending in a return-mark. The footer prints two lines prior to the last line of each page. As with the header, you can include Stage 2 printing commands, and you don't need to set the header to use a footer.

g GOTO (link) next file. Put this command as the last line in your document. Follow the command with the letter D for disk or T for tape, then a colon (:), then the name of the file to print next. After the text in memory is printed, the link command loads the next file into memory. You can continue linking in successive files, but don't include a link in the last file. Before you start printing a linked file, make sure the first of the linked files is in memory. When printing is finished, the last file linked to will be in memory.

Stage 2 Commands

These commands either precede a line of text, or are embedded within one.

c Centering. Put this at the beginning of a line you want to center. This will center only one line ending in a return-mark. Repeat this command at the beginning of every line you want centered. Centering uses the page-width setting (see above) to properly center the line. To center a double-width line, either set the page width to 40 or pad out the rest of the line with an equal number of spaces. If you use double width, remember that the spaces preceding the centered text will be double-wide spaces.

When *SpeedScript* encounters this command, it prints the current page number. You usually embed this within a header or footer.

u A simple form of underlining. It does not work on Commodore printers, but only on printers that recognize CHR$(8) as a backspace and CHR$(95) as an underline character. Underlining works on spaces, too. Use the first **u** to start underlining, and another one to turn off underlining.

Fonts And Styles

Most dot-matrix printers are capable of more than just printing text at ten characters per inch. The Commodore MPS-801 can print in double width and reverse field. Some printers have several character sets, with italics and foreign language characters. Most can print in double width (40 characters per line), condensed (132 characters per line), and in either pica or elite. Other features include programmable characters, programmable tab stops, and graphics modes. Many word processors customize themselves to a particular printer, but *SpeedScript* was purposely designed not to be printer-specific. Instead, *SpeedScript* lets you define your own Stage 2 printing commands.

You define a programmable *printkey* by choosing any character that is not already used for other printer commands. The entire uppercase alphabet is available for printkeys, and you can choose letters that are related to their function (like D for double width). You enter these commands like printer commands, by first pressing **CTRL-£**.

To define a printkey, just press CTRL-£, then the key you want to assign as the printkey, then an equal sign (=), and finally the ASCII value to be substituted for the printkey during printing.

Here's how you could program reverse-video printed text. Reverse-on, a value of 18, prints all text in reverse video until canceled by reverse-off (a value of 146) or a carriage return. So define SHIFT-R as 18 and SHIFT-O as 146 (CTRL-£ SHIFT-R=18). Anywhere you want to print a word in reverse, bracket the word with printkey R and printkey O.

You can similarly define whatever codes your printer uses for features like double width or emphasized mode. For your convenience, four of the printkeys are predefined, though you can change them. The keys 1–4 are defined as 27, 14, 15, and 18, common values for most printers.

We hope *SpeedScript* is as valuable to you as it has been for thousands of existing users. Again, for more information, see the article accompanying the Commodore 64 version in the March 1985 issue of COMPUTE!. And keep sending in your suggestions and criticisms—someday they may help make *SpeedScript 4.0* a reality.

SpeedScript 3.0 For VIC-20

Please refer to the "MLX" article before entering this listing.

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4663 :166,181,240,032,169,000,075
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4675 :000,000,153,000,000,200,164
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9907 :172,146,041,076,138,038,022
9913 :201,069,208,017,056,173,141
9919 :132,041,237,000,041,056,186
9925 :237,131,041,168,169,032,207
9931 :076,173,038,201,085,208,216
9937 :008,173,151,041,073,001,144
9943 :141,151,041,201,035,208,224
9949 :018,140,146,041,174,138,110
9955 :041,173,139,041,032,205,090
9961 :221,172,146,041,076,138,003
9967 :038,174,147,041,189,237,041
9973 :041,032,168,031,076,138,219
9979 :038,174,150,041,240,026,152
9985 :133,059,041,127,201,065,115
9991 :144,018,201,091,176,014,139
9997 :170,165,059,041,128,073,137
10003 :128,074,074,133,059,138,113
10009 :005,059,096,032,250,019,230
10015 :056,173,245,040,237,002,016
10021 :041,170,173,246,040,237,176
10027 :003,041,032,205,221,169,202
10033 :001,141,254,040,096,008,077
10039 :014,211,080,069,069,068,054
10045 :211,067,082,073,080,084,146
10051 :032,051,046,048,000,013,001
10057 :018,066,089,032,195,072,033
10063 :065,082,076,069,083,032,230
10069 :194,082,065,078,078,079,149
10075 :078,000,194,085,070,070,076
10081 :069,082,032,195,076,069,108
10087 :065,082,069,068,000,194,069
10093 :085,070,070,069,082,032,005
10099 :198,085,076,076,000,196,234
10105 :069,076,069,084,069,032,008
10111 :040,211,044,215,044,208,121
10117 :041,000,058,032,211,085,048
10123 :082,069,063,032,217,047,137
10129 :206,058,000,197,210,193,241
10135 :211,197,032,193,204,204,168
10141 :000,197,082,065,083,069,141
10147 :032,040,211,044,215,044,237
10153 :208,041,013,018,208,082,227
10159 :069,083,083,032,146,210,030
10165 :197,212,213,210,206,018,213
10171 :032,084,079,032,069,088,059
10177 :073,084,000,208,082,069,197
10183 :083,083,032,070,079,082,116
10189 :077,065,084,032,075,069,095
10195 :089,058,000,211,065,086,208
10201 :069,058,000,212,065,080,189
10207 :069,032,197,210,210,207,124
10213 :210,000,211,084,079,080,125
10219 :080,069,068,000,214,069,223
10225 :082,073,070,089,032,197,016
10231 :082,082,079,082,000,206,010
10237 :079,032,069,082,082,079,164
10243 :082,083,000,147,032,018,109
10249 :212,146,065,080,069,032,101
10255 :079,082,032,018,196,146,056
10261 :073,083,075,063,000,204,007
10267 :079,065,068,058,000,214,255
10273 :069,082,073,070,089,058,218
10279 :000,208,082,069,083,083,052
10285 :032,018,210,197,212,213,159
10291 :210,206,146,000,196,073,114
10297 :083,075,032,067,079,077,214
10303 :077,065,078,068,058,000,153
10309 :036,206,079,032,210,079,199
10315 :079,077,000,206,079,032,036
10321 :084,069,088,084,032,073,255
10327 :078,032,066,085,070,070,232
10333 :069,082,046,000,147,018,199
10339 :211,146,067,082,069,069,231
10345 :078,044,032,018,196,146,107
10351 :073,083,075,044,032,018,180
10357 :208,146,082,073,078,084,020
10363 :069,082,063,000,196,069,090
10369 :086,073,067,069,032,078,022
10375 :085,077,066,069,082,063,065
10381 :000,211,069,067,079,078,133
10387 :068,065,082,089,032,193,164
10393 :068,068,082,069,083,063,094
10399 :032,035,063,000,198,073,048
10405 :076,069,078,065,077,065,087
10411 :058,000,147,208,082,073,227
10417 :078,084,073,078,071,046,095
10423 :046,046,013,013,000,206,251
10429 :069,088,084,032,083,072,105
10435 :069,069,084,044,032,146,127
10441 :210,197,212,213,210,206,169
10447 :018,000,200,085,078,084,160
10453 :032,070,079,082,058,000,022
10459 :206,079,084,032,198,079,129
10465 :085,078,068,000,210,069,223
10471 :080,076,065,067,069,058,134
10477 :000,209,213,201,212,000,048
```

IBM Graphics Printer Switch Settings

Michael A. Covington

Although neither the IBM PC reference manuals nor the instructions that come with the printer mention them, the IBM Graphics Printer has a set of internal DIP switches which allow you to control how it operates.

The switch settings within the IBM Graphics Printer determine the defaults that apply when the printer is first turned on; almost all of them can be overridden by sending appropriate escape codes to the printer. But there may be situations in which you'll want to change the defaults.

To get at the switches, unplug the printer, disconnect the interface cable, remove the plastic cover and wire-grid paper guide, and turn the printer upside down. Unscrew the four Phillips-head screws at the corners, then put tape over the deep holes they sit in so they won't fall out. Now turn the printer right side up, pull off the paper advance knob, and carefully lift off the cover, maneuvering it clear of the knob shaft.

On the main circuit board you should find two sets of DIP switches under removable plastic dust covers. Using a ballpoint pen or similar tool, set them according to your preference (see accompanying table), put the dust covers back in place, and reassemble the printer.

The most useful thing the switches can do for you is give you access to the full character set. The *IBM PC Guide to Operations* lists two character sets for the printer; in character set 1, ASCII codes 128 to 159 are duplicates of codes 0 to 31, but in character set 2, they are accented letters for foreign languages. (Both character sets include a variety of mathematical symbols and box-drawing characters.)

A few programs may not work properly with character set 2; if you have this problem, you can either set the switch back to its original setting, or set the printer back into character set 1 by sending it ASCII codes 27 and 55 as an initialization sequence.

IBM Graphics Printer Internal Switch Settings
Asterisks mark how switches are set at the factory.

A. Large set of 8 switches:

1 Not used; normally on.

2 Off: Printer generates a linefeed of its own after every carriage return.
*On: Printer does not advance to next line until it receives a linefeed character (ASCII 10).

3 *Off: When more characters are received than will fit on a line, printer begins a new line.
On: When more characters are received than will fit on a line, printer overprints on same line.

4 *Off: ASCII code 24 clears the printer buffer.
On: ASCII code 24 has no effect.

5 Not used; normally on.

6 Off: Buzzer on printer will not sound.
*On: Buzzer sounds when out of paper or when ASCII code 7 is received.

7 *Off: Character set 1.
On: Character set 2.

8 Off: Computer sends "Select" signal to activate printer.
*On: Printer is always ready to receive input.

B. Small set of 4 switches:

1 *Off: Paper length is 11 inches.
On: Paper length is 12 inches.

2 *Off: Lines are spaced 6 to the inch.
On: Lines are spaced 8 to the inch.

3 *Off: Paper feeding is controlled by computer.
On: Paper automatically advances after printing.

4 *Off: Printer does not skip over the perforation where pages join.
On: Printer skips 1 inch where pages join. ©

Creating Atari Machine Language Strings

Tom Sak

This clever utility program converts a machine language subroutine into fast-executing BASIC string statements and stores them on disk for later use. Requires at least 16K RAM.

The most common way to use a machine language subroutine in a BASIC program is to convert the object code into decimal numbers, put the numbers into DATA statements, then READ the numbers and POKE them into memory.

However, if you'd like your programs to initialize faster, or if you're running short of memory, there's a better technique you should consider: converting the machine language into strings. Using string assignment statements instead of DATA statements not only saves the time required to POKE the numbers into memory, it also consumes only about one-third as much RAM. The main limitation of this technique is that the machine language routine must be completely relocatable—not a serious handicap for short (under 256-byte) routines.

The listing following this article, "ML String Creator," is a self-modifying BASIC program that automatically creates string assignment statements from your object code and LISTs them to disk for inclusion in other BASIC programs.

Direct Execution From A String

The string technique works because, essentially, these statements are equivalent:

```
10 DATA 33,37,106,47,122,65
30 A$="!%j/zA"
```

If your subroutine contains internal JMPs or JSRs, which are not relocatable, you must use the conventional DATA statement technique. Until a BASIC program runs, you don't know where a certain string will end up in memory; therefore, if you encode your machine language (ML) into a string, it will end up at an unpredictable memory address. However, when the ML is relocatable, it is possible to execute the subroutine directly from the string with a statement like this:

```
50 X=USR(ADR(A$))
```

The ADR() function lets you find the beginning address of the string (and therefore of your subroutine). Of course, this assumes you have previously encoded the ML into the string variable A$ with ML String Creator.

The string assignment statement also is preferable when you're trying to squeeze a few more bytes into limited memory. Each ML byte has a decimal value in the range of 0–255. Representing this in a decimal DATA statement requires as many as three bytes, plus a comma to separate the entries. In a string assignment, each ML byte is represented as a single character.

There are a few other limitations, however. It's not possible to represent the decimal values 155 or 34 inside quotes in a string assignment. The value 155 represents a carriage return or end-of-line marker which cannot be embedded in the assignment statement, even as part of an escape sequence. The value 34 represents the double-quote character used as a delimiter in the assignment statement.

Stringing It All Together

Keeping these limitations in mind, you can use ML String Creator to locate an ML subroutine somewhere in memory, turn it into one or more string assignment statements, and LIST the statements to disk. It is your responsibility to initially load the ML into memory. If you're using an assembler that lets you switch back to BASIC without erasing memory, you can assemble directly to memory and then load ML String Creator to convert the object code into strings.

The program begins by requesting that you supply the first and last memory addresses (in decimal) of your routine, the name of the string variable to be created, and a line number for the first string assignment statement. A maximum of 80 bytes can be contained in a single statement

string, and the maximum ML program length accommodated by the program is 256 bytes.

The string variable name is limited to seven characters, including the trailing $ symbol which must be present. Finally, the line number for the first string assignment statement must be greater than 190. Subsequent lines are numbered in increments of ten.

ML String Creator is self-modifying; the string assignment statements become a part of the program. However, the part of the program which is taking care of business protects itself from modification. The program can be used repeatedly without being reloaded, but it will grow in size.

The self-modification feature is also used to produce a LIST statement at line 150. In the listing below it appears as a REM statement, but after the string assignment statements are created it will be modified.

Finally, ML String Creator will prompt you for the filename of the disk file in which it will store the assignment statements. This filename and the first and last statement numbers of the created statements are concatenated with 150 LIST, in addition to the appropriate commas and double quotes, to form a genuine LIST statement.

Checking For Quotes And Carriage Returns

Before retiring, the program will indicate the memory locations, if any, at which a decimal value of either 155 or 34 was encountered. The program substitutes a value of zero in these instances. If more than ten occurrences of 155 or 34 are detected, the program stops with an error message.

The technique used to create the strings consists of printing string assignment statements on a previously cleared screen, just as you would do from the keyboard if you were typing in a BASIC program. After the last string assignment statement is placed on the screen, a CONT statement is written on the screen in immediate mode (that is, with no statement number).

Another feature of the program is its automatic RETURN. Normally when you press RETURN after typing a BASIC statement, the statement is either immediately executed (for example, LIST) or incorporated into your BASIC program (for example, 10 A=B*C). The Atari has a switch which makes pressing the RETURN key optional. The switch is location 842, which usually contains a 12. POKE 842,13 switches to automatic RETURN.

Brace Yourself For Fast Action

Processing takes place rapidly when the computer presses RETURN, so be prepared. The commands to be processed must be both correct and in the right place on the screen, and the cursor must be positioned on or above the first statement. If an error is detected, a message will be written on the screen, but the Atari, using the automatic RETURN, will process the error message as a command and a syntax error will result.

Lines 50 and 70 write the string assignment statements onto the screen. Line 85 places CONT on the screen and positions the cursor at the top, well above the first statement to be processed. The switch at location 842 is set at line 90. Then the program is stopped. When you are entering BASIC statements from the keyboard, you don't have one of your BASIC programs executing, and that is what is happening here, except that the text is "typed," the cursor is positioned, and RETURN supplied by the computer.

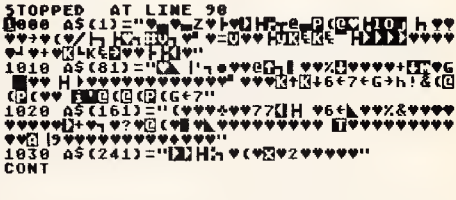
Watching The Atari Type

If you want to watch this action, you can see most of it by looking at the screen carefully. Insert the following statement to see what the screen looks like immediately before processing:

```
86 GOTO 86
```

Press BREAK to regain control; a STOPPED AT LINE 86 message will be displayed, destroying portions of the information which you are attempting to view.

The figure below depicts a typical screen image immediately following the STOP statement in line 90 and just before the automatic RETURN. (Of course, the actual string characters will vary depending on the ML subroutine you are reading.) Don't forget to delete line 86 when you've seen enough.



The CONT statement is the last one executed by the flying cursor before it returns control to your program. (The immediate execution of GOTO 100 would have the same effect.) The same technique is used to create and incorporate the LIST statement.

With a little imagination, you can modify this program to accept other forms of input of decimal or hexadecimal values to be converted to character strings, or to accept an ML object file from disk.

If you are interested in adapting some of

these techniques to your own programs, there are a few things to watch out for. First, when placing the cursor at the top of the screen prior to activating the automatic RETURN, be sure to allow sufficient room so the screen text produced by the STOP statement won't overwrite the statements which your program placed on the screen. Second, be sure to turn off the automatic RETURN (POKE 842,12) when you're done.

ML String Creator

Please refer to "COMPUTE!'s Guide To Typing In Programs" before entering this listing.

```
PF 1 REM ML STRING MAKER
HA 2 REM Writes string assignment sta
     tements from up to 256 memory lo
     cations and LISTs them on disk.
AJ 10 DIM NAME$(10),RTN(11),RTN1(11)
EC 20 ? CHR$(125);"ENTER -";? "START
     ADDRESS";:INPUT FBA:? " END ADD
     RESS";:INPUT LBA
JN 25 ? " STRING NAME";:INPUT NAME$:?
      " FIRST STATEMENT NUMBER";:INP
     UT FSN:SN=FSN-10:I=LEN(NAME$)
CC 30 IF LBA<FBA OR LBA-FBA>255 OR I<
     2 OR I>7 OR NAME$(I,I)<>"$" OR
     FSN<191 THEN ? CHR$(253):GOTO 2
     0
OM 35 ? CHR$(125):? :DISP=-79:FBA=FBA
     -80
OJ 40 SN=SN+10:FBA=FBA+80:DISP=DISP+8
     0:IF FBA>LBA THEN GOTO 85
FL 45 RANGE=79:IF LBA-FBA<79 THEN RAN
     GE=LBA-FBA
FO 50 ? SN;" ";NAME$;"(";DISP;")=";CH
     R$(34);:FOR I=FBA TO FBA+RANGE:
     J=PEEK(I)
DC 60 IF J=155 THEN J=0:K=K+1:RTN(K)=
     I:IF K=11 THEN 190
DI 65 IF J=34 THEN J=0:L=L+1:RTN1(L)=
     I:IF L=11 THEN 190
AL 70 ? "{ESC}";CHR$(J);:NEXT I:? CHR
     $(34)
AJ 75 GOTO 40
FP 85 ? "CONT":POSITION 0,0
EG 90 POKE 842,13:STOP
ON 100 POKE 842,12
CN 110 ? CHR$(125);"ENTER -";? " FILE
     NAME";:INPUT NAME$
LA 120 ? CHR$(125):? :? :? "150 LIST"
     ;CHR$(34);"D:";NAME$;CHR$(34);
     ",";FSN;",";SN-10:? "CONT":POS
     ITION 0,0
HB 130 POKE 842,13:STOP
PB 140 POKE 842,12
NM 145 ? CHR$(125);"LISTING ";NAME$
DK 150 REM LIST statement will be ins
     erted here.
LP 160 ? CHR$(125):IF K>0 THEN ? "Zer
     o substituted for 155 @":FOR I
     =1 TO K:? " ";RTN(I);:NEXT I
NF 170 IF L>0 THEN ? :? "Zero substit
     uted for 34 @":FOR I=1 TO L:?
     " ";RTN1(I);:NEXT I
HA 180 END
EO 190 ? CHR$(125):? "TOO MANY 155s A
     ND/OR 34s":END
```

©

Commodore File Protector

John Dearinger

You won't have to worry about accidentally erasing important files off your disks with "Commodore File Protector." It lets you protect individual files or entire disks. The program works on any Commodore 64, VIC-20 with at least 3K RAM expansion, Plus/4, or 16 with a 1541 or 1541-compatible disk drive.

Have you ever scratched a program on a disk and then realized you just deleted the wrong one? Perhaps it was a mental error, or maybe you used a filename with a wild card (* or ?) and got rid of more than you bargained for.

Some computers, such as Apple and Atari, allow you to lock and unlock disk files, offering some protection. Commodore computers, however, don't have any such commands. Neither does the Commodore 1541 disk drive. Yet, interestingly enough, the 1541 does have the routine built into its Disk Operating System (DOS). In fact, the disk drive actually uses the routine to check for a locked file during a write operation.

Here's what happens. Whenever the 1541 starts to scratch a file, it first must find the file on the disk to make sure it exists. Once it is found, the disk drive knows several things about the file, because this information is stored with the filename in the directory on track 18. It knows the track and sector where the first block of the file is stored on the disk. It knows how long the file is and the file type (PRG, SEQ, etc.) by reading the byte stored in the first location of each file entry. The first byte normally is a number from 128 to 132 decimal. (See the charts on pages 56 and 57 of the *1541 User Guide*.) Another DOS routine also checks this location to tell if a file is locked or not. If bit 6 is set, DOS knows the file is locked and won't modify it in any way. For example, if the 1541 finds the number 194 decimal instead of 130 decimal, it knows that a PRG file is locked.

"Commodore File Protector" uses the direct access disk commands to lock the files on a disk so they cannot be deleted—until, of course, they've been unlocked.

Disk Command Menu

To make File Protector compatible with your computer, only one line must be added to the program listing. If you have a Commodore 64, add this line:

```
20 F1=4:F7=3:POKE53281,12:POKE53280,6
```

If you have a VIC-20, add this line:

```
20 F1=39:F7=63:NS=4:U$=LEFT$(U$,23)
```

If you have a Plus/4 or 16, add this line:

```
20 FORA=1TO8:KEYA,"":NEXT:KB=239:SF=1347:
   KL=198:F1=4:F7=3
```

Once File Protector is running, you'll have several options on a menu. First, you can view a directory. This option is offered within several of the routines as well.

You have the option to lock all the files on a disk at once. This will save you a great deal of typing and time when you first use the program on a disk.

You can choose to lock or unlock one specific file at a time, in case you later want to scratch a file or modify a file and replace the old version.

When a file is locked, a less-than sign appears to the right of the file type whenever you list the directory—whether you LOAD "$",8, use DOS 5.1, or choose option 1 on the File Protector menu.

Scratching a file is another option on the menu, and the only one that allows wild cards (* or ?). All the other options require you to enter the exact filename. Some interesting possibilities arise from this. For example, by locking some files and not others, you could clear a disk of unwanted files with many different names (and save a lot of typing) just by specifying an asterisk (*) for a filename to delete.

The last option on the File Protector menu allows you to lock or unlock the entire disk itself. It's best to use this command only on full or completed disks, though, because once the disk is locked, it cannot be written on again until it is unlocked. Locked files on a disk don't prevent the rest of the disk from being used.

Not Totally Foolproof

There are three normal ways to remove files from a disk:

1. Scratch the file
2. Clear the directory with **OPEN15,8,15,"N0:filename"**
3. Reformat the disk with **OPEN15,8,15,"N0:filename, ID#"**

Files locked with Commodore File Protector will withstand number 1 but not numbers 2 and 3. A locked disk will withstand numbers 1 and 2 but not number 3.

One final word of warning: I strongly recommend that you do *not* use this program on any commercial software. These programs often use parts of track 18 in their copy protection, and since File Protector alters that track, it may change something that shouldn't have been changed.

No More Sticky Tabs

The method for locking the entire disk is similar to that for locking a file. In track 18, sector 0, the Block Allocation Map (BAM) is stored. The first two locations (bytes 0 and 1) tell the 1541 where it can find the first directory block containing the first eight filenames on the disk. The third location (byte 2) denotes on which drive this particular disk was formatted. This location should contain the hexadecimal number $41 (65 decimal), which indicates 1541 and 4040 format. If it doesn't, the 1541 will assume that the disk was formatted on a different disk drive and will read the disk, but refuse to write on it.

So, by writing a different number at this location, the disk can be effectively write-protected. No more of those sticky little tabs that are always coming off anyway.

The program also changes location 166 from a $41 (65 decimal) to a $42 (66 decimal). This has no effect on whether the disk is write-protected or not, but is done only to visually indicate a locked disk. The directory header will read 0 "Diskname" ID 2B—note the 2B instead of the normal 2A.

Commodore File Protector

Please refer to "COMPUTE!'s Guide To Typing In Programs" before entering this listing.

```
5 PRINT"{CLR}":Q$=CHR$(13)                    :rem 59
10 U$="{RVS}{40 SPACES}":KB=198:SF=653:KL
   =203:NS=12                                 :rem 223
50 GOSUB1240:GOTO1080                         :rem 232
60 PRINT#15,"U1";2;0;T;S:GOTO670              :rem 119
70 PRINT#15,"B-P 2 0":PRINT#15,"U2";2;0;T
   ;S:GOTO670                                 :rem 90
80 T=PEEK(681):S=PEEK(682):RETURN             :rem 8
90 REM:::LOCK ALL FILES:::                    :rem 30
100 PRINT"{CLR}"SPC(NS)"LOCK ALL FILES":P
    RINTU$:GOSUB660:T=18:S=1                  :rem 75
110 P=2:GOSUB60                               :rem 113
120 GET#2,A$:T1=ASC(A$+CHR$(0)):GET#2,A$:
    S1=ASC(A$+CHR$(0))                        :rem 196
130 FORI=0TO7:PRINT#15,"B-P";2;P+32*I
                                              :rem 133
140 GET#2,A$:A=ASC(A$+CHR$(0)):IFA=.THEN1
    70                                        :rem 137
150 IFAAND64THEN170                           :rem 106
160 PRINT#15,"B-P";2;P+32*I:PRINT#2,CHR$(
    AOR64);                                   :rem 248
170 NEXT:GOSUB70:IFETHENRETURN                :rem 21
180 PRINT"TRACK"T"SECTOR"S"IS LOCKED":T=T
    1:S=S1:IFTTHEN110                         :rem 168
190 GOSUB730:GOSUB740:RETURN                  :rem 35
200 REM:::READ DIRECTORY:::                   :rem 163
210 H$=CHR$(18):PRINT"{CLR}{RVS}HOLD [SHI
    FT] TO PAUSE{DOWN}                        :rem 20
220 GOSUB660:PRINT#15,"M-R"CHR$(144)CHR$(
    7)CHR$(23)                                :rem 103
230 FORI=0TO22:GET#15,A$:H$=H$+(A$+CHR$(0
    )):NEXT:PRINTH$"{BLK}":POKE140,1:T=18
    :S=1                                      :rem 84
240 GOSUB60:SYS828:GOSUB80:IFPEEK(SF)THEN
    WAITSF,1,1                                :rem 8
250 IFTTHEN240                                :rem 63
260 PRINT#15,"M-R"CHR$(250)CHR$(2):GET#15
    ,LO$:PRINT#15,"M-R"CHR$(252)CHR$(2)
                                              :rem 224
270 GET#15,HI$:PRINTASC(LO$+CHR$(0))+256*
    ASC(HI$+CHR$(0))" BLOCKS FREE:rem 188
280 GOSUB730:GOSUB740:POKE140,0:RETURN
                                              :rem 125
290 REM:::INPUT NAME:::                       :rem 140
300 PRINT"{DOWN}[F1] EXIT{13 SPACES}[F7]
    {SPACE}DIRECTORY                          :rem 166
310 PRINT"{DOWN}FILENAME? "CU$;:POKEKB,0:
    FS=""                                     :rem 100
320 KQ=PEEK(KL):GETA$:IFA$=""ANDKQ=64THEN
    320                                       :rem 131
330 IFKQ=F1ORKQ=F7THENPRINTCHR$(20):RETUR
    N                                         :rem 246
340 IFA$=CHR$(20)ANDF$=""THEN320 :rem 254
350 IFA$=CHR$(13)ANDF$<>""THENPRINTCHR$(2
    0):RETURN                                 :rem 4
360 IFA$=CHR$(13)ANDF$=""THEN320    :rem 2
370 IFA$=CHR$(20)THENPRINTCHR$(20)A$CU$;:
    F$=LEFT$(F$,LEN(F$)-1):GOTO320:rem 98
380 PRINTCHR$(20)A$CU$;:F$=F$+A$:GOTO320
                                              :rem 27
390 REM:::LOCK A FILE:::                      :rem 102
400 PRINT"{CLR}";                             :rem 51
405 PRINTSPC(NS)"LOCK A FILE":PRINTU$
                                              :rem 12
410 GOSUB300:IFKQ=F1THENRETURN    :rem 208
420 IFKQ=F7THENGOSUB210:GOTO405   :rem 201
430 POKE679,1:GOSUB780:GOSUB660:T=18:S=1
                                              :rem 167
440 GOSUB60:SYS828:A=PEEK(252):IFATHEN470
                                              :rem 244
450 GOSUB80:IFTTHEN440                        :rem 101
460 PRINT"{DOWN}{RED}FILE NOT FOUND{BLK}
    {DOWN}":GOTO410                           :rem 206
470 IF(AAND64)THENPRINTF$:PRINT" IS ALREA
    DY LOCKED":GOSUB730:GOSUB740:GOTO510
                                              :rem 44
480 P=PEEK(255):GOSUB60:PRINT#15,"B-P";2;
    P:PRINT#2,CHR$(AOR64);                    :rem 243
490 GOSUB70:IFETHEN400                        :rem 85
500 GOSUB730:PRINTF$:PRINT"IS LOCKED":GOS
    UB740                                     :rem 142
510 POKE679,0:GOTO400                         :rem 206
520 REM:::UNLOCK A FILE:::                    :rem 4
530 PRINT"{CLR}";                             :rem 55
535 PRINTSPC(NS)"UNLOCK A FILE":PRINTU$
                                              :rem 179
540 GOSUB300:IFKQ=F1THENRETURN    :rem 212
550 IFKQ=F7THENGOSUB210:GOTO535   :rem 209
560 POKE679,1:GOSUB780:GOSUB660:T=18:S=1
                                              :rem 171
```

```
570 GOSUB60:SYS828:A=PEEK(252):IFATHEN600
                                    :rem 243
580 GOSUB80:IFTTHEN570              :rem 109
590 PRINT"{DOWN}{RED}FILE NOT FOUND{BLK}
    {DOWN}":GOTO540                 :rem 214
600 IF(AAND64)=.THENPRINTF$Q$"IS ALREADY
    {SPACE}UNLOCKED":GOSUB730:GOSUB740:GO
    TO640                           :rem 231
610 P=PEEK(255):GOSUB60:PRINT#15,"B-P";2;
    P:PRINT#2,CHR$(AAND135);        :rem 79
620 GOSUB70:IFETHEN530              :rem 84
630 GOSUB730:PRINTF$:PRINT"IS UNLOCKED":G
    OSUB740                         :rem 53
640 POKE679,0:GOTO530               :rem 214
650 REM:::OPEN FILE:::              :rem 45
660 CLOSE2:CLOSE15:OPEN15,8,15,"I0":OPEN2
    ,8,2,"#"                        :rem 254
670 INPUT#15,E,EM$,ET,ES            :rem 146
680 IFE=73ORE=26THENGOSUB730:GOTO710
                                    :rem 248
690 IFETHENPRINT"{RED}{RVS}ERROR:":PRINTE
    ","EM$","ET","ES"{BLK}":GOSUB730:END
                                    :rem 225
700 RETURN                          :rem 119
710 IFE=73THENPRINT"DISK IS LOCKED":GOSUB
    740:RETURN                      :rem 251
720 PRINT"REMOVE WRITE PROTECT TAB":GOSUB
    740:RETURN                      :rem 42
730 CLOSE2:CLOSE15:RETURN           :rem 114
740 PRINT"{RVS}{DOWN}PRESS ANY KEY{DOWN}"
    :POKEKB,0                       :rem 80
750 KQ=PEEK(KL):GETA$:IFA$=""ANDKQ=64THEN
    750                             :rem 145
760 RETURN                          :rem 125
770 REM:::STORE NAME FOR ML:::      :rem 12
780 IFLEN(F$)<16THENF$=F$+CHR$(160):GOTO7
    80                              :rem 209
790 FORI=1TOLEN(F$):POKE6B3+I,ASC(MID$(F$
    ,I,1)):NEXT:POKE700,0:RETURN    :rem 199
800 REM:::LOCK ENTIRE DISK:::       :rem 243
810 PRINT"{CLR}"SPC(NS)"LOCK ENTIRE DISK"
    :PRINTU$                        :rem 116
820 PRINT"{DOWN}INSERT DISK IN DRIVE
    {2 SPACES}[F1] TO ABORT":FORTD=1TO900
    :NEXT:GOSUB740                  :rem 8
830 IFKQ=F1THENRETURN               :rem 137
840 GOSUB660:T=18:S=0:GOSUB60:PRINT#15,"B
    -P 2 2"                         :rem 233
850 PRINT#2,CHR$(66);:PRINT#15,"B-P 2 166
    ":PRINT#2,CHR$(66);:GOSUB70:IFETHEN81
    0                               :rem 42
860 GOSUB730:GOSUB660:GOSUB730      :rem 98
870 PRINT"THE DISK IS NOW WRITE PROTECTED
    ":GOSUB740:RETURN               :rem 176
880 REM:::SCRATCH A FILE:::         :rem 73
890 PRINT"{CLR}";                   :rem 64
895 PRINTSPC(NS)"SCRATCH A FILE":PRINTU$
                                    :rem 248
900 GOSUB300:IFKQ=F1THENRETURN      :rem 212
910 IFKQ=F7THENGOSUB210:GOTO895     :rem 218
920 INPUT"{DOWN}ARE YOU SURE";A$:IFA$<>"Y
    "THEN890                        :rem 73
930 GOSUB660:PRINT#15,"S0:"+F$:INPUT#15,E
    ,EM$,ET,ES:IFE>1THENGOSUB6B0:GOTOB90
                                    :rem 215
940 GOSUB730:IFET=.THENPRINT"{RED}FILE IS
     LOCKED OR NOT ON DISK{BLK}":GOSUB740
    :GOTOB90                        :rem 97
950 IFET>1THENPRINTET;EM$:GOSUB740:GOTO89
    0                               :rem 228
960 PRINTF$:PRINT"IS SCRATCHED":GOSUB740:
    GOTO890                         :rem 55
970 REM:::UNLOCK A DISK:::          :rem 24
980 PRINT"{CLR}"SPC(NS)" UNLOCK{2 SPACES}
    DISK":PRINTU$                   :rem 88
990 PRINT"{DOWN}INSERT DISK IN DRIVE
    {3 SPACES}[F1] TO ABORT":FORTD=1TO900
    :NEXT:GOSUB740                  :rem 16
1000 IFKQ=F1THENRETURN              :rem 175
1010 GOSUB660:T=18:S=0:GOSUB60      :rem 44
1020 PRINT#15,"M-W";CHR$(1);CHR$(1);CHR$(
     1);CHR$(65);                   :rem 135
1030 PRINT#15,"B-P 2 2":PRINT#2,CHR$(65);
     :PRINT#15,"B-P 2 166"          :rem 251
1040 PRINT#2,CHR$(65);:GOSUB70:IFETHEN980
                                    :rem 202
1050 GOSUB60:GOSUB730:PRINT"DISK IS UNLOC
     KED                            :rem 5
1060 GOSUB740:RETURN                :rem 252
1070 REM:::MAIN MENU:::             :rem 98
1080 PRINT"{CLR}{BLK}{DOWN}"SPC(NS-2)"<<F
     ILE PROTECTOR>>"               :rem 31
1090 PRINT"{DOWN} 1) DIRECTORY      :rem 153
1100 PRINT" 2) LOCK ALL FILES       :rem 65
1110 PRINT" 3) LOCK A FILE          :rem 88
1120 PRINT" 4) UNLOCK A FILE        :rem 253
1130 PRINT" 5) LOCK ENTIRE DISK     :rem 237
1140 PRINT" 6) UNLOCK A DISK        :rem 12
1150 PRINT" 7) SCRATCH A FILE       :rem 63
1160 PRINT" B) QUIT                 :rem 27
1170 PRINT"{2 DOWN} ENTER YOUR CHOICE"
                                    :rem 52
1180 GETA$:IFA$=""THEN1180          :rem 183
1190 C=VAL(A$):IFC<1ORC>8THEN1180:rem 176
1200 ONCGOSUB210,100,400,530,810,980,890,
     1220                           :rem 71
1210 GOTO1080                       :rem 198
1220 CLOSE2:CLOSE15:END             :rem 148
1230 REM:::VARIABLES & M/L:::       :rem 141
1240 POKE679,0:POKE140,0:CU$=CHR$(31)+CHR
     $(161)+CHR$(144)               :rem 102
1250 FORQZ=B2BTO1006:READZQ:POKEQZ,ZQ:NEX
     T:RETURN                       :rem 34
1260 DATA 169,0,141,168,2,133,253,162,2,3
     2,198,255,32                   :rem 46
1270 DATA 228,255,141,169,2,32,228,255,14
     1,170,2,230,253                :rem 192
1280 DATA 230,253,32,228,255,133,252,165,
     253,133,255,32,228             :rem 91
1290 DATA 255,32,228,255,230,253,230,253,
     160,0,32,228,255               :rem 241
1300 DATA 230,253,153,189,2,200,24,192,16
     ,144,242,160,243               :rem 230
1310 DATA 32,228,255,230,253,165,144,240,
     3,141,168,2,200                :rem 17B
1320 DATA 208,241,165,252,208,7,173,168,2
     ,208,22,240,191                :rem 194
1330 DATA 165,140,240,3,32,199,3,173,167,
     2,240,3,32                     :rem 191
1340 DATA 175,3,173,168,2,240,171,32,204,
     255,96,160,0                   :rem 42
1350 DATA 185,172,2,240,8,217,189,2,208,7
     ,200,208,243                   :rem 47
1360 DATA 238,168,2,96,169,0,133,252
                                    :rem 245
1370 DATA 96,160,0,185,189,2,240,6,32,210
     ,255,200,20B                   :rem 41
1380 DATA 245,165,252,41,64,240,10,169,14
     4,32,210,255,169,60,32,210,255,169
                                    :rem 111
1390 DATA 13,32,210,255,169,144,32,210,25
     5,96                           :rem 167
```

C. Regena

Matching Quiz

This month's column presents a general matching-quiz program that can be adapted to any topic. It contains no graphics or sound, so it should be easy to translate to other computers. Feel free to add your own graphics and sound to enhance your particular quiz.

The sample program is a quiz of terms and their definitions. This particular quiz can be used in a computer literacy class for learning general computer terminology.

First the program prints a definition on the screen followed by 12 possible terms. The user must press the letter corresponding to the term defined. If the answer is correct, the program continues and that definition will not appear again. If the answer is incorrect, the program gives the correct answer and the definition *will* appear again.

The score is kept by keeping track of how many times an answer is attempted. A perfect score in this case would be 12. Each time a definition is shown, the score is incremented.

If you want to use this matching quiz for several different topics, type in and save the program consisting of lines 100 through 710. Now, to build a custom program, start with this basic structure and then add DATA statements starting at line 720. Then save the quiz on a different tape or with a different name on the disk. Different quizzes will simply have different DATA statements. You may also need to change the instructions.

Creating DATA Statements

Notice that each DATA statement contains two items separated by a comma. The first item is the term, and the second item is the corresponding definition. If the definition contains a comma, it must be surrounded by quotation marks. Otherwise, the computer will mistake the characters after the comma for another DATA element.

On a quiz for a different topic, use the same idea—put matching parts in the same DATA statement.

Line 110 DIMensions arrays for the quiz. Since this quiz has 12 definitions and terms, the numbers in the DIM statement are 12. You will need to adjust this for the number of items in your own quiz. Line 120 sets the variable N to 12 for the 12 items in this example program. If you have a different number of items, be sure to change this line.

Lines 130–200 clear the screen and print the instructions. Lines 210–230 READ from the DATA the 12 words (W$) and their corresponding definitions (D$). Within the FOR-NEXT loop, a counter with the variable name A varies from 1 to 12. Line 220 looks for DATA statements and reads in order first a word W$(A), then the definition D$(A). The number A keeps them matched up properly. Make sure when you type your DATA statements that you have matched pairs of items (separated by commas).

Program Setup

Lines 240–270 wait for the user to press ENTER before clearing the screen to start the quiz. Line 280 initializes the score (SC) to zero at the beginning of each quiz.

Lines 290–310 set up a temporary word file array, T$(A), which is the same as the original W$ array. This temporary array is used in choosing the terms for the quiz.

Lines 320–550 perform the quiz for the number of items to be matched, N, or in this case 12. Line 330 increments the score SC for each time a definition is shown.

Line 340 clears the screen. Lines 350–370 randomly choose one of the terms which has not

previously been matched correctly. The term chosen is denoted by the number R. Line 380 prints the definition D$(R) corresponding to the term chosen.

Lines 390–420 print all of the terms possible for answers with a letter to indicate the answer. Line 430 sounds a prompting tone. Lines 440–460 accept the user's answer, making sure the key pressed is an acceptable letter of one of the terms, then prints the letter chosen.

Evaluating The Answer

Line 470 tests the user's response with the correct answer stored in R. If the answer is incorrect, lines 480–510 print the correct answer, wait for the user to press ENTER, then branch back to line 330 to increment the score and print the next definition. If the answer is correct, lines 520–540 print the message CORRECT!, set T$(R) equal to the null string so the term cannot be chosen again, and then wait for the user to press ENTER. Line 550 increments P for the loop counter to go to the next problem.

After the quiz is complete and all terms have been correctly matched, line 560 clears the screen. Lines 570–580 print the possible score and the user's score. Lines 590–600 print a message if there is a perfect score.

Lines 610–670 present the option to try the quiz again or to end the program.

Lines 680–710 contain the subroutine to wait for the user to press the ENTER key before continuing the program.

Lines 720–840 in this program contain the data for the quiz. Notice that some of the definitions contain extra spaces. These are used to print the definition on the 28-column screen without splitting words.

Customizing The Quiz

Now to change the topic of the quiz. Decide how many items will need to be matched. Keep in mind how it will look when printed on the 24-row screen. Change the DIMension statement of line 110 and the definition of N in line 120 to reflect the number of items.

Next add the DATA statements starting with line 720. For example, if you want a quiz on BASIC programming commands, a typical DATA statement might be:

```
720 DATA GOTO,Command to transfer program
control
```

A history quiz might contain:

```
720 DATA 1492,Columbus discovered America.
```

An algebra quiz could use:

```
720 DATA x=2,x+5=5x-3
```

A states and capitals quiz could use:

```
720 DATA Providence,Rhode Island
```

When typing the DATA statements, make sure there are matching pairs. If there are short words, you may put more than one matching pair in a DATA statement—just be sure to use commas to separate each item. With longer phrases, make sure you use spaces to print the phrase properly on the screen without splitting words.

Remember that you can add your own sound effects and graphics for positive reinforcements on correct answers. You may also wish to use graphics and sound as part of the matching process.

If you wish to save typing effort and obtain a copy of this program, send a blank cassette or disk, a stamped, self-addressed mailer, and $3 to:

C. Regena
P.O. Box 1502
Cedar City, UT 84720

Please be sure to specify the title of the program and the type of computer you use.

Matching Quiz For TI

Please refer to "COMPUTE!'s Guide To Typing In Programs" before entering this listing.

```
100 REM  MATCHING QUIZ
110 DIM W$(12),T$(12),D$(12)
120 N=12
130 CALL CLEAR
140 PRINT TAB(9);"CHAPTER 1"
150 PRINT :::"A DEFINITION WILL BE
    GIVEN."
160 PRINT :"CHOOSE THE TERM WHICH"
170 PRINT :"MATCHES THE DEFINITION.
    "
180 PRINT :"PRESS THE LETTER OF THE
    "
190 PRINT :"ANSWER."
200 PRINT :"THERE WILL BE";N;"PROBL
    EMS."
210 FOR A=1 TO N
220 READ W$(A),D$(A)
230 NEXT A
240 PRINT ::"PRESS <ENTER> TO START
    ."
250 CALL KEY(0,K,S)
260 IF K<>13 THEN 250
270 CALL CLEAR
280 SC=0
290 FOR A=1 TO N
300 T$(A)=W$(A)
310 NEXT A
320 FOR P=1 TO N
330 SC=SC+1
340 CALL CLEAR
350 RANDOMIZE
360 R=INT(N*RND)+1
370 IF T$(R)="" THEN 360
380 PRINT D$(R)::
390 FOR A=1 TO N
400 PRINT CHR$(64+A);"  ";W$(A)
410 NEXT A
420 PRINT
430 CALL SOUND(150,1500,2)
440 CALL KEY(0,K,S)
```

```
450 IF (K<65)+(K>64+N)THEN 440
460 PRINT CHR$(K);:
470 IF K-64=R THEN 520
480 PRINT "THE CORRECT ANSWER IS"
490 PRINT CHR$(R+64);"--";W$(R)
500 GOSUB 680
510 GOTO 330
520 PRINT "CORRECT!"
530 T$(R)=""
540 GOSUB 680
550 NEXT P
560 CALL CLEAR
570 PRINT "THERE WERE";N;"DEFINITIO
    NS."
580 PRINT :"YOUR SCORE: ";SC;"ANSWE
    RS":::
590 IF SC<>N THEN 610
600 PRINT "GOOD WORK!":::
610 PRINT "PRESS 1 TO TRY AGAIN"
620 PRINT "{6 SPACES}2 TO END PROGR
    AM"
630 CALL KEY(0,K,S)
640 IF K=49 THEN 270
650 IF K<>50 THEN 630
660 PRINT ::"2  END":::
670 STOP
680 PRINT :"PRESS <ENTER>.";
690 CALL KEY(0,K,S)
700 IF K<>13 THEN 690
710 RETURN
720 DATA DOCUMENTATION,THE BOOKS AN
    D MANUALS THAT  ACCOMPANY A COM
    PUTER-RELATEDPRODUCT
730 DATA SYSTEM,A SET OR ARRANGEMEN
    T OF{5 SPACES}PARTS ACTING TOGE
    THER TO{4 SPACES}PERFORM A FUNC
    TION
740 DATA INFORMATION SYSTEM,"A SYST
    EM THAT TAKES INPUT,  PROCESSES
     IT, AND PRODUCES  INFORMATION
    AS OUTPUT"
750 DATA COMMUNICATION SYSTEM,"A SY
    STEM THAT CONSISTS OF A SENDER,
    A PHYSICAL CHANNEL,  AND A RECE
    IVER"
760 DATA HARDWARE,THE PHYSICAL COMP
    ONENTS{5 SPACES}ASSOCIATED WITH
     A COMPUTER  OR OTHER SYSTEM
770 DATA SOFTWARE,PROGRAMS THAT CON
    TROL THE{3 SPACES}FUNCTIONS OF
    SYSTEMS
780 DATA NETWORK,TWO OR MORE COMMUN
    ICATING{3 SPACES}DEVICES THAT A
    RE CONNECTED  TOGETHER
790 DATA APPLICATION,WHAT IS DONE W
    ITH COMPUTERS
800 DATA CIRCUIT,AN INTERCONNECTED
    SET OF{4 SPACES}COMPONENTS THAT
     PERFORM AN ELECTRONIC FUNCTION
810 DATA BINARY SIGNAL,A COMPUTER C
    IRCUIT THAT IS  REPRESENTED BY
    TWO DIFFERENTLEVELS OF CURRENT
820 DATA DATA,"FACTS, NUMBERS, AND
    SYMBOLS PROCESSED BY A COMPUTER
     TO  PRODUCE INFORMATION"
830 DATA BINARY DIGIT (BIT),A BASIC
     BUILDING BLOCK OR{3 SPACES}UNI
    T OF INFORMATION USED IN COMPUT
    ER SYSTEMS
840 END                                  ©
```

THE BEGINNER'S PAGE

Tom R. Halfhill, Editor

Programs Within Programs

Imagine what your life would be like if every time you had to perform a routine task—such as starting your car or switching on a TV—you had to think really hard about it, almost as if you were learning the task for the first time. Starting a car doesn't seem too difficult, but it does require you to execute a number of smaller tasks in exactly the same sequence each time. You have to find the right key, unlock the door, grasp the handle, pull open the door, climb into the seat, stick the key into the ignition, twist the key, and press the gas pedal.

Yet, unless the car is brand-new or belongs to someone else, you can probably do all of this with your eyes closed, like a blindfolded soldier reassembling his rifle. That's because you've performed the actions so many times that they're carved into your unconscious. You just think *start the car,* and a little "program" takes over.

When you think about it, your brain stores thousands of such tiny programs. They let you perform everyday tasks almost on autopilot. Without them, every routine action would be like

a new learning experience. Life might be more interesting, like a young child's, but you'd be a lot less efficient.

Computer programs can benefit from the same sort of efficiency. After all, a program at its most basic level is just a list of instructions telling the computer how to perform some kind of job. That job might be something as simple as adding two numbers or something as complex as modeling the economy of a large nation. Still, even simple jobs can often be broken down into several smaller tasks which are executed repeatedly. So why make the computer do things the hard way? Why not equip your programs with the same kind of subprograms that your brain seems to use to automate routine tasks?

This concept of smaller programs within larger programs is so powerful that virtually every computer language offers some way to do it. By identifying these repetitive tasks and turning them into subprograms or *subroutines*, you can write programs that run faster, consume less memory, and are easier to understand and modify.

When To Use A Subroutine

Your brain acquires a subroutine by rote—it subconsciously memorizes a task that you perform over and over again. Today's computers aren't quite intelligent enough to learn this way, so you have to spell it out for them more literally with BASIC commands.

First you have to decide when to take a piece of a program and make it into a subroutine. This judgment comes naturally after a while, but as a general rule, any small task which is performed more than once in a program is a candidate for a subroutine.

Once you've identified this task, you write the little routine and make the program detour to those lines whenever you need to perform that task. At the end of each subroutine, you use the command RETURN to automatically go back into the main program and proceed with other things.

Let's try an example. Assume you're writing a program that frequently pauses and asks the user to press a key. With no subroutines, this is how clumsy the program would be:

```
90 DIM A$(1):REM This line for Atari only
100 PRINT "During the Civil War,"
110 PRINT "more American soldiers died"
120 PRINT "than in all other"
130 PRINT "American wars combined."
140 PRINT "PRESS C AND RETURN TO
    CONTINUE";
150 INPUT A$
160 IF A$<>"C" THEN GOTO 140
170 PRINT "Poor medical care accounted"
180 PRINT "for many casualties,"
190 PRINT "but outmoded military tactics"
200 PRINT "were also to blame."
210 PRINT "PRESS C AND RETURN TO
    CONTINUE";
220 INPUT A$
230 IF A$<>"C" THEN GOTO 210
...
```

Notice how the lines which ask the user to press a key (lines 140–160 and 210–230) are simply repetitious; only the line number references are different.

In each case these lines keep printing the prompt PRESS C AND RETURN TO CONTINUE until the user presses the C key. (Make sure to press a capital C if you try running this example. If you have a TI-99/4A, change every occurrence of THEN GOTO to THEN in this and all following examples.) A little three-line routine like this one might not seem like much, but if it's repeated throughout a long program, considerable space and programming time would be wasted. This is an ideal candidate for a subroutine.

Why Not GOTO?

At this point, you might be thinking about building a subroutine with the GOTO command. After all, a subroutine requires a detour from the main program, and GOTO is a programming detour (see last month's column). Why not just jump to the subroutine with GOTO and then exit from it the same way? The program might look like this:

```
90 DIM A$(1):REM This line for Atari only
100 PRINT "During the Civil War,"
110 PRINT "more American soldiers died"
120 PRINT "than in all other"
130 PRINT "American wars combined."
140 GOTO 1000
150 PRINT "Poor medical care accounted"
160 PRINT "for many casualties,"
170 PRINT "but outmoded military tactics"
180 PRINT "were also to blame."
190 GOTO 1000
200 PRINT "For instance, many battles"
210 PRINT "were fought with mass charges"
220 PRINT "of infantry and cavalry."
230 GOTO 1000
...
1000 PRINT "PRESS C AND RETURN TO
     CONTINUE";
1010 INPUT A$
1020 IF A$<>"C" THEN GOTO 1000
1030 GOTO 150
```

At first this seems to fit the bill. The lines which await the user's keystroke are grouped together in a neat subroutine at the end of the program. All it takes is a simple instruction—GOTO 1000—to activate (or *call*) the subroutine.

If you try running the program, however, a problem soon becomes apparent. The subroutine works great the first time it's called. The first paragraph of text appears on the screen, followed by the prompt, and the program continues print-

ing when you press C. But after the second time the subroutine is called, the program prints the second paragraph all over again! In fact, it keeps printing the same paragraph no matter how many times you press C—it never reaches the third paragraph at all.

GOTO is the culprit. GOTO 1000 works okay for *calling* the subroutine, because the routine is always at line 1000. But GOTO doesn't work so well when *returning* from the subroutine. The line number in the routine's final GOTO statement is fixed (GOTO 150), but the line number where the program should continue after calling the routine keeps changing. What's needed is a substitute for GOTO that always knows how to pick up where the program left off. That substitute is the pair of commands GOSUB and RETURN.

GOSUB: A GOTO With Brains

If you understood how the above programs work, you'll have no trouble at all grasping GOSUB and RETURN. GOSUB (which means *GOto SUBroutine*) is merely a smarter version of GOTO. The statement GOSUB 1000 does the same thing as GOTO 1000—it detours the program to line 1000. However, it also makes the computer remember *where it detoured from.* Then, when a RETURN statement is encountered, the program automatically returns from the subroutine and begins executing the statement which immediately follows the original GOSUB.

Here's how the previous example would look after GOSUB and RETURN are substituted for the GOTO statements that caused the problem:

```
90 DIM A$(1):REM This line for Atari only
100 PRINT "During the Civil War,"
110 PRINT "more American soldiers died"
120 PRINT "than in all other"
130 PRINT "American wars combined."
140 GOSUB 1000
150 PRINT "Poor medical care accounted"
160 PRINT "for many casualties,"
170 PRINT "but outmoded military tactics"
180 PRINT "were also to blame."
190 GOSUB 1000
200 PRINT "For instance, many battles"
210 PRINT "were fought with mass charges"
220 PRINT "of infantry and cavalry."
230 GOSUB 1000
240 END
...
1000 PRINT "PRESS C AND RETURN TO
     CONTINUE";
1010 INPUT A$
1020 IF A$<>"C" THEN GOTO 1000
1030 RETURN
```

Think how much memory (and programming time) you could save by simply inserting a GOSUB 1000 statement whenever you want the user to press a key to continue, instead of redundantly entering the routine itself each time you need it. The memory savings are even more dramatic with longer subroutines.

For that reason alone, GOSUB and RETURN are worth their weight in RAM chips. Yet memory conservation is only one advantage of using subroutines in your programs. We already mentioned how they can increase execution speed and help make programs easier to understand and modify. But they can also drastically reduce the time you spend writing and debugging a program. Once you get a subroutine up and running without bugs, you can call it with confidence whenever necessary. If an error does result, you can be fairly certain that something outside the subroutine is causing the error. This narrows down your search for the elusive bug.

Subroutines can also make it less intimidating to write large, complex programs. By breaking a big job down into many smaller jobs, and then tackling them one at a time, the program seems to fall together much more easily. In fact, many programmers keep a library of frequently used subroutines and stick them into new programs wherever needed.

Questions Beginners Ask

Q In manuals, books, and articles, I keep seeing the term "default." What does default mean?

A *Default* means the way something starts out, its normal condition. For example, many computer games default to one-player mode. If there are two players, you have to let the game know by pressing a special key.

In computer terminology, default can refer to the standard setting of a switch, the screen colors when you first turn on the computer, the number stored in a memory location before it's altered by a program, and many other things. For example, the LOAD command on a Commodore 64 or VIC-20 defaults to tape instead of disk. If you type:

```
LOAD"PROGRAM NAME"
```

the computer assumes you are loading from the cassette recorder and responds PRESS PLAY ON TAPE. To load a program from the disk drive, you have to add a device number to the command which overrides the default:

```
LOAD"PROGRAM NAME",8
```

Another example is a dot-matrix printer which defaults to a standard typeface. To print in a special typeface such as bold or italics, you must send the printer a command (usually from within a program) which overrides the default setting. ©

INSIGHT: Atari

Bill Wilkinson

Atari Acquires Apple!

As I write this, the Winter Consumer Electronics Show (CES) in Las Vegas has just ended. By now you have probably read in the papers and magazines just what real marvels the new Atari Corporation introduced at CES. While I didn't get a chance to attend CES (though others from my company were there), I did have the privilege of getting some preshow information about Atari's new products. Also, thanks to being just a bit nosey, I learned a little about how Atari developed their remarkable new computers and even a little bit of what's yet to come.

Purchase Obvious In Retrospect

(An important aside: The issue of COMPUTE! which will carry this article is dated April 1985. However, since this issue will most likely appear on newsstands and in subscribers' mail by about mid-March, you might be reading this before April. If so, be sure to keep all of what I am about to reveal secret until at least the first of April.)

Reveals Other Buys

Anyway, as I started to say, I was lucky enough to be privy to some early information and (thanks to my nosey nature) overhear even more. One thing I overheard was a simple question, "Should we take the Mac with us?" (An obvious reference to an Apple Macintosh.) It seems that in the process of designing the 130ST and 520ST computers, the engineers at Atari looked at several existing computers. Now, no rival companies were about to be so generous as to donate machines. So, looking back, it seems obvious that Atari had to go out and buy several—including the Mac, of course.

IBM Failure Described

In the process of evaluating the various computers, Atari also was able to look at the microprocessors (CPUs) which they used. It comes as no surprise that the 8/16 bit 8088 used by the IBM PC was rejected early on as being unable to achieve the speed Atari desired. So what processor got the nod for the 130ST and 520ST?

Leonard Tramiel Departs Company

Although I have managed to enjoy Leonard Tramiel's company in several meetings, the one time we managed to get in a really interesting discussion of processors he had to depart early (for another meeting, probably). Before he left, he did seem to indicate that his personal choice for a CPU might be the National Semiconductor 32016 and 32032 processors. They are very powerful and very orthogonal machines, but (and this is speculation on my part) the fact that they are available only from National Semi probably makes choosing them difficult for any company.

In any case, Atari chose to go with the tried and true Motorola 68000 series of processors, the same one used in the Apple Macintosh and Lisa computers. (An aside: The official meaning of the *ST* designation is "Sixteen/Thirty-two" for the 16-bit bus and 32-bit registers of the 68000 chip. *XE* implies XL compatibility, but *E*xtended.)

Future Plans Fall Flat

What about all the loyal Atari 400/800/1200XL/600XL/800XL owners? Has Atari completely forgotten them? *No way!* Apple has Mac and Lisa, both built around a 68000 chip, in its "sort of 32-bit" division, and the IIe and IIc, both using a 650x CPU, in its 8-bit division.

Lo and behold! We already saw that Atari

has the 130ST and 520ST built around the 68000. Does it really surprise you to learn that the 65XE and 130XE will be produced using a 650x processor? And we were even given the privilege of having a set of drawings for a portable computer (in the 650x line) dropped flat on the table in front of us!

Original Projections Unrealized

The same day we saw those plans for the portable, we also got to see some of the features that the new machines will be sporting. On that day I decided that my predictions of success for Atari, which I made in this column in December, could very well have been ridiculous underestimates.

Operations Shut Down

What kind of features impressed me? I think it will be obvious to you when you read a spec sheet at your local dealer or the other CES coverage in this issue. In the meantime, I'll give a brief list of what I think are the best features of each machine at the end of this column. I tried to ask some of my contacts at Atari about a couple of things I am not quite clear on, but the lure of CES left the software and engineering departments virtually shut down for these four days.

Long-Term Outlook Bright

If there is any area of concern to those of us here at Optimized Systems Software, it is about those products where our software sales overlap those of Atari Corporation. New prices on Atari software have made us rethink some of our plans, but we think that there will always be sophisticated and/or advanced users out there who will be willing to pay a little more for higher quality. And we are not alone: The number of companies showing Atari-compatible software or hardware at CES was almost amazing. Will we stay in the Atari software market? How could we not?

At Last

"What the heck," you ask, "was all that about?" The answer: Every word that you just read was true. Even the subheadlines are properly explained in the text. Oh, I may have bent some words here and there to make the headlines more spectacular, but that was the whole purpose of this exercise. I always wanted to show how you can take an innocuous and/or positive review and generate sensational *National Enquirer*-type headlines.

If you're an acrostics fan, you may have already caught the significance of the first letter of each headline. (Go back and reread them if you want a minor laugh.) This is, of course, my annual attempt at some humor. It's not very subtle or well-hidden this year, because I thought it would be fun to find out how many COMPUTE! readers actually plow through all my verbiage. If you got to here unscathed, congratulations. Time for a complete change of pace.

New Machine Features

This is just a simple table of what I feel are the most important features of four of the new Atari machines. I am sure that more info will be available by the time you read this, but maybe these specs will whet your appetite.

65XE

- 6502-series processor.
- 64K of RAM.
- Very, very compatible with 800XL.
- Nicely sculptured case and keyboard.
- Cartridge port on rear (where our ugly orange cartridges won't be so obtrusive).
- About $100.

130XE

- Identical to 65XE *plus*:
- 128K of RAM (supported as a ramdisk by new DOS 2.5).
- Expansion port on rear (used in conjunction with cartridge slot).
- About $150.

130ST

- 68000-series processor.
- 128K of RAM.
- 192K of ROM.
- Uses Digital Research's GEM windowing and display system—virtually identical in form and function to Apple's Macintosh system.
- Built-in RS-232 interface.
- Built-in parallel printer interface.
- Built-in disk controller handles up to four floppy disk drives (designed to use *very* inexpensive 3.5-inch drives, 360K each—priced perhaps as low as $100!).
- DMA-capable expansion port (designed for *very* fast hard disk drives).
- Three-voice sound chip.
- Color graphics (640 × 400 in black and white, 640 × 200 with four colors, 320 × 200 with 16 colors).
- Cartridge slot (up to 128K ROM in cartridge).
- 10 special function keys.
- MIDI interface (for music synthesizers and ???).
- About $400.

520ST

- All the features of the 130ST *plus*:
- 512K of RAM instead of 128K.
- About $600 (Yep . . . that gives you a color "Fat Mac" at around $1,000).

Information Please

It's time, once again, to respond to some letters. I may have made a mistake in publishing the P.O. box where you can write me directly, since I find myself with about five or six times as much mail to answer as I had before. Until I get adjusted to answering this much correspondence, please bear

with me.

For this month, I have decided to select some letters which (I think) really *need* answers. Surprisingly, for such varied topics, the answers to all may be much the same.

Bob Dorn, of College Park, Georgia, was the first of three or four to ask me how to use an Atari 1030 direct-connect modem to upload and download files. Well, you got caught in the great Atari let's-protect-the-poor-dumb-user game. For reasons best understood only by now-extinct marketing people at the old Atari, neither the 835 or 1030 modem came with software support for uploading and downloading programs, text files, and so on. I guess those marketers never used a computer with a modem, so they couldn't see any use for the capabilities.

Luckily, many other people, including a few software gurus, found themselves in the same fix you are in. One commercial company which seems to be doing a lot of work with these modems is Gardner Computing, P.O. Box 388, Holbrook, NY 11741. I am *not* endorsing them (I have never used any of their products—I have only read their ads), and I apologize in advance for inadvertently slighting any other companies supplying similar software.

There are other solutions. See the "Readers' Feedback" letter headlined "Atari Modem Update" in the February 1985 issue of COMPUTE!. There are also some programs floating around in public domain user group libraries which allow upload/download and more. As a general rule, such programs come without documentation (or, at most, with a few paragraphs on the disk with the program), so you may need to do a little detective work to use them.

Good Local Support

Again, though, there may be another solution. *Join your local user group.* Come on now, what will it cost you? One evening and a couple of dollars a month will probably be the best investment you ever made in computing. And so many user groups have people who know the answers. To almost anything you ask!

Another practical reason for joining such a group is that Atari has already announced that its primary means of providing programming support to users will be through the user group network. The toll-free phone lines are gone, and the support group is decimated. This may be the *only* way to get technical answers in the future (aside from writing to me or "Readers' Feedback").

All of this, and we haven't even mentioned the fact that most user groups have literally *hundreds* of programs available for next to nothing. Okay, okay. Some of the programs don't work right, are poorly written, are too slow, etc. So what? You are getting what you paid for and more. If nothing else, a cruddy little Atari BASIC subroutine may lead your computer to uses you hadn't thought of yet.

So join, join, join. Why wait five months for my answer to appear in this magazine when help is available two miles from your home?

How do you know where/who/when/what your local group is? Well, try asking at local computer stores, even those that don't sell Atari products. Look in your local paper. Look in Atari-oriented magazines, which sometimes have listings of clubs. If you are really desperate, send me a *self-addressed and stamped* card or envelope. No guarantees, because I don't know where *all* the clubs are, but if there's one on my list I will tell you. *Please* use me only if all else fails, because (1) I'm always too busy, (2) it may take me some time to answer, and (3) if I ask my kids to help me with this, they will charge me.

Deluged With Information

From going to users who can't find what they need, we go to a couple of readers who have found too much. Jamie Patterson, of Hooker, Oklahoma, sent me a well-argued plea for some help in choosing material about his three-month-old baby, an 800XL computer. I quote: "How does a three-month-old know which books to choose?"

Darned good question. My usual answer, when I want to choose a new computer book, is to go to two or three bookstores that carry a couple of hundred computer books each and browse. This works because there are at least a dozen such bookstores within reasonable distance of my house. Now, I have to admit I don't know where Hooker, Oklahoma, is, but if it isn't within 20 miles of a major computer bookstore, my method won't work for Jamie. What can he do?

The editors of COMPUTE! might like me to answer, "Buy a COMPUTE! book." But whatever book you buy, you must choose one which is at the right level for you. From COMPUTE! Books, the most general material may be found in the *First, Second,* and *Third Book of Atari,* along with the two books on *Atari Graphics.* Some, but not all, of this material is relevant to someone who has learned the fundamentals of Atari BASIC.

Suppose, though, that you aren't even to that level yet. You don't know a PRINT from a PLOT statement. Where do you turn? Since Atari stopped shipping copies of *Inside Atari BASIC* with the XL computers, buyers have been left to choose their own tutorial. And what should they choose?

My trouble is that every time I look at a book that purports to teach BASIC (or word

processing or assembly language or . . .), I find something wrong. I don't like the order of presentation of the topics. There are mistakes in the section on how to speed up your programs. The author encourages poor programming style. The list goes on and on. So I refuse to make a firm recommendation.

The Great Book Survey

What, then, can Jamie Patterson and others like him do? What else? Join a user group. Ask other Atari owners. Ask to look at their books. Okay, so maybe none of the over-200 user groups is close enough to Jamie. And, besides, he asked *me* for an answer. I guess I should do something, right?

So here it comes. I am asking you, my readers, to make some comments on the books *you* have learned from. Don't stick to learning BASIC. Any aspect of Atari computers is eligible, even manufacturers' manuals. To make life easier for me, just send the title(s) of the book(s), the level (1 to 10, with 1 being rank beginner), and your overall rating (0 for trash to 10 for perfection). A postcard will do fine.

I don't want any experts evaluating these books; I can mishandle that aspect myself. Instead, I want actual real-life experiences. Did or did not the book teach you what it said it would? If it did, was it an uphill battle or did the style make it downright easy for you? I can't respond personally to these rating cards, but I will report the results received by April 20 in the August or September issue (sorry, but that's the fastest turnaround possible).

Translators, Again

Robert Glover, of Cleveland, Tennessee, has been the proud owner of an Atari 400, an 800, and now an 800XL. He asks me why he can't simply use the binary save option of Atari DOS to make a copy of the 800's operating system ROMs and then load that file into his 800XL as a home-brew translator disk. He suggests that I perform this service in my column.

Well, in theory, and with some modifications to his method, I *might* be able to do so. Why won't I? First, there are several problems to overcome. Two of the simpler examples: (1) You can't write/save ROM directly with DOS 2.0S; you have to copy it down to RAM first. (2) Joystick ports 3 and 4 are used for *output* in an 800XL and for *input* in an 800.

Also, how many readers have access to both an 800 and 800XL? And, finally, why go to that kind of trouble when the translator disks are so available?

Ah, but that last point was raised by Mr. Glover. He says he cannot find the translator disks anywhere. Hmmmm. Guess where I am going to suggest he look? Right. Ask your local user group. And that brings us back to the quandary of the last reader: What if there is no user group nearby?

I have a couple of partial solutions. First, there are a few mail-order organizations which, in addition to selling commercial software, sell public domain programs for reasonably low prices. Right now, LotsaBytes (15445 Ventura Blvd., Suite 10, Sherman Oaks, CA 91413) seems to be the leader in this category, but I should also mention DynaComp, *Antic*, and *ANALOG* (the latter two offer primarily games and BASIC utilities from their magazines).

Perhaps even better, many user groups (especially the larger ones) allow mail-order memberships. Since there are so many of these groups just crying for members, I hesitate to recommend one over another. But because their newsletter has been around the longest and may have the greatest number of readers, I will at least mention the very friendly people of ACE (3662 Vine Maple Dr., Eugene, OR 97405).

So my message this month is clear: Atari is very, very, very much alive and well. Keep your interest in your machine similarly healthy by joining a user group. ©

IBM BASIC's Undocumented SHELL Command

Michael A. Covington

With DOS 3.0, IBM has announced a number of new features for disk BASIC. At least one of them is actually present in DOS 2.0 and 2.1 as well, though the manuals do not mention it. That feature is a command called SHELL that allows you to execute DOS commands from within BASIC. (The technique does not work with PCjr Cartridge BASIC.)

The SHELL command in IBM BASIC takes one parameter, a character string containing the DOS command to be executed. SHELL works by loading, from drive A, a second copy of COMMAND.COM (the DOS command processor) and invoking it as a subprocess. (Note that this implies that COMMAND.COM must be present on the disk in drive A when the SHELL command is executed.) The top level COMMAND.COM and the BASIC interpreter are in suspended animation until the subprocess finishes; then control returns to BASIC.

SHELL handles the cursor somewhat awkwardly. When the SHELL command is executed, the screen is cleared from the current cursor position to the bottom; DOS writes its output there, scrolling as needed (the twenty-fifth line scrolls along with the others). But when control returns to BASIC, the cursor suddenly appears one line below where it was when the subprocess started, ignoring all screen activity that took place under the subprocess.

The best way to prevent chaos on the screen is to execute a CLS (clear-screen) immediately after each SHELL, or as soon afterward as you're done looking at the output.

Not A Child

The one command that SHELL cannot issue, either directly or indirectly, is BASIC (or BASICA). If you try to do this, you get the message "You cannot run Basic as a Child of Basic"—naturally enough, you can't run BASIC in the subprocess because most of BASIC is in ROM and there's only one copy of it in the machine. If you issue a SHELL and COMMAND.COM is not on drive A, you get a "File not found" error within BASIC.

The most useful SHELL commands are probably:

```
SHELL "A:"
SHELL "B:"
```

and the like, to change logged disks. These are foolproof commands; they produce no messages to clutter up the screen, and they can't terminate abnormally.

You can also use SHELL without parameters, in immediate mode, to enter the DOS command mode. The advantage of this over SYSTEM is that when you're done issuing DOS commands, you can type EXIT and return to BASIC with your program undisturbed.

Most kinds of errors in the subprocess will return you to BASIC with no problem, but a few, such as typing A in response to "Abort, Retry, Ignore," will leave you in the DOS command level of the subprocess, in which case you must type EXIT to get back to BASIC.

One At A Time

Don't issue several SHELL commands in succession if you can avoid it; each of them loads COMMAND.COM all over again. Instead, if you have a series of commands to issue, write them onto a .BAT file from within BASIC, and give one command to run the whole file.

The accompanying program demonstrates

one way to use SHELL to create a menu-driven user interface for DOS. Naturally, a practical program would include many more options and more error-checking.

Purpose:	Executes a DOS command from within BASIC. This is done by loading a second copy of COMMAND.COM and invoking it as a subprocess.
Versions:	Cassette Disk Advanced Compiler no yes yes ?
Format:	SHELL or SHELL X$
Remarks:	X$ is a character string constant, variable, or expression containing any valid DOS command. In order for SHELL to work, COMMAND.COM must be present on disk A. If it is not, the message "File not found" is displayed. X$ can be an internal DOS command or invoke a .COM, .EXE, or .BAT file. However, the BASIC interpreter cannot be invoked using SHELL; if this is attempted, the message "You cannot run Basic as a Child of Basic" is displayed. The amount of memory available in the subprocess is markedly less than is available in DOS by itself. If X$ is omitted, the user is placed at the DOS command level of the subprocess. To return to the calling BASIC program, type the command EXIT. Certain fatal errors in the subprocess may also leave the user at the DOS command level of the subprocess; again, typing EXIT returns control to BASIC. However, most errors in the subprocess return control to the calling BASIC program automatically.
Examples:	SHELL (to go temporarily into command mode) SHELL "B:" (to change logged disk) SHELL "DIR A: : SORT : MORE" SHELL "MYFIL" (to invoke MYFIL.COM, MYFIL.BAT, or MYFIL.EXE, as the case may be)

Demo of SHELL Command

```
GI 10 ' COMMAND.COM must be on drive A
IA 20 ' MORE.COM and CHKDSK.COM must be
ME 30 '    on the current default disk
KN 40 CLS: KEY OFF
BD 50 PRINT "Welcome to menu-driven DOS."
FI 60 PRINT
LD 70 PRINT "Available functions are:"
NG 80 PRINT "  1  Directory of disk A"
AG 90 PRINT "  2  Directory of disk B"
QJ 100 PRINT "  3  Disk and memory inform
      ation"
BD 110 PRINT "  4  Copy a file"
AB 120 PRINT "  5  View a file"
JK 130 PRINT "  6  End this program"
JI 140 PRINT
KA 150 INPUT "Choose one...";N
BL 160 IF N=6 THEN CLS: END
OF 170 IF (N<1) OR (N>5) THEN BEEP: GOTO
      150
BN 180 CLS
KA 190 ON N GOTO 210,240,270,320,370
MD 200 ' directory of A
AH 210 SHELL "dir a:"
CP 220 GOTO 400
DN 230 ' directory of B
CN 240 SHELL "dir b:"
CF 250 GOTO 400
DG 260 ' disk & memory info.
CG 270 INPUT "Drive to check ";A$
BI 280 IF A$="a"OR A$="A" THEN SHELL "chk
      dsk a:"
FG 290 IF A$="b"OR A$="B" THEN SHELL "chk
      dsk b:"
CM 300 GOTO 400
ML 310 ' copy a file
MC 320 INPUT "File to copy from ";A$
CM 330 INPUT "File to copy onto ";B$
ED 340 SHELL "copy "+A$+" "+B$
CG 350 GOTO 400
KD 360 ' view a file
DA 370 INPUT "Name of file ";A$
CG 380 SHELL "more <"+A$
LJ 390 ' finish up
DN 400 LOCATE 25,1
MD 410 WHILE INKEY$<>"": WEND
OB 420 PRINT "(Press any key to continue.
      ..)";
LA 430 WHILE INKEY$="": WEND
OF 440 GOTO 40
```

©

Apple SuperFont

Custom Character Set Graphics For The Apple

Tim Victor, Editorial Programmer

Here's a significant enhancement for graphics on Apple II-family computers. With "Apple SuperFont," you can now place upper- and lowercase text anywhere on the high-resolution screen. In addition, you're not limited to the built-in character set, either—you can easily define foreign character sets, italics, boldface, and underline fonts, as well as shapes for high-speed animated games in BASIC. Apple SuperFont is an all-new, original version of the SuperFont series of programs published by COMPUTE! *for Atari, Commodore 64, and TI computers and adds several new features especially for the Apple. It requires a 48K or 64K Apple II+, Apple IIe, or Apple IIc, with either DOS 3.3 or ProDOS.*

Without resorting to machine language, programming high-speed graphics is difficult on the Apple. High-resolution graphics look nice, but shape tables are too slow for most animation purposes. One alternative is to use character graphics for animation. Characters can move a whole block (character position) at a time, and can be placed on the screen with a simple PRINT statement. Unfortunately, ordinary Apple characters aren't very suitable for games or even business charts.

But now there's a way around these problems. With "Apple SuperFont" and its accompanying utility programs, you can easily redefine a character into practically any shape you want and print it directly on the hi-res graphics screen. Custom character sets are a snap to design, and fast animation is as simple as printing a character, erasing it, and printing it again in a new location.

Several programs already exist for printing characters on the hi-res screen, including HRCG (High Resolution Character Generator), which is part of the Apple DOS Toolkit. The Apple SuperFont HROUT program works much like HRCG, putting characters on the high-resolution screen from a table of character images, but the Apple SuperFont system is much more versatile.

The Apple SuperFont Editor makes it easy for you to create character sets (fonts) for use with HRCG or HROUT. Special features help you design multicharacter shapes and allow you to see the effects of the Apple's unusual use of color in hi-res graphics. Once you've created or customized a character set, you can easily use these fonts in your own programs.

Typing Apple SuperFont

To run SuperFont, you need to have four files on the same disk: APPLEFONT, APPLEFONT2, HROUT, and NORMAL.SET. There are two different versions of APPLEFONT. Program 1 is for using SuperFont with DOS 3.3. Program 2 shows the changes necessary to use Program 1 with ProDOS. The other three files need no changes to be used with either disk operating system.

APPLEFONT2 (Program 3, the Apple SuperFont Editor), NORMAL.SET (Program 4), and HROUT (Program 5) are all machine language binary files and must be entered with the Apple's built-in machine language editor (monitor). It's easy; you don't need to understand machine language to use these programs.

Here's how to type them in. To enter the monitor, type CALL −151. The Applesoft prompt (normally a]) will be replaced by the monitor's prompt, an asterisk (*). To enter a line from the listing, first type in the four-digit hexadecimal number, then type a colon (:) instead of the hyphen shown in the listing produced by the monitor. This is the address where you'll enter the rest of the line. Type in the rest of the line after the colon, leaving a space between each two-digit number. After eight numbers, press RETURN and enter the address for the next line.

Again, use a colon instead of the hyphen shown in the program listing. If you want to review what you've entered to check for accuracy, you can list a block of data by typing the address of the first location in the range, then a period, then the last address, and pressing RETURN.

Once you've entered one of the machine language programs, save it to disk using the BSAVE command. This command can be used either from BASIC or from the monitor (you can exit the monitor and return to BASIC by pressing CTRL-C, then RETURN). To BSAVE Program 3 (APPLEFONT2), the command is:

```
BSAVE APPLEFONT2,A$1000,L$FE0
```

Save Program 4 (NORMAL.SET) by entering:

```
BSAVE NORMAL.SET,A$8D00,L$300
```

Save Program 5 (HROUT) by entering:

```
BSAVE HROUT,A$300,L$58
```

Because of the length of APPLEFONT2, typing mistakes could be difficult to find. As a check, BLOAD APPLEFONT2 and enter the following line, then hit RETURN:

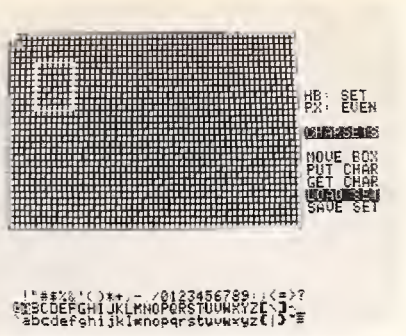
```
S=0 : FOR I=4096 TO 8159 : S=S+PEEK(I) : NEXT : PRINT S
```

If the result of this calculation is not 365090, there is at least one error in your copy of APPLEFONT2. To help locate errors, we've included a small checksum program (Program 6). To use it, BLOAD APPLEFONT2, then run Program 6. If you have mistyped some data, it will tell you where to look to find the mistake.

When all the files are entered and saved to disk, type RUN APPLEFONT. APPLEFONT first checks to see which operating system is in your Apple. If the correct operating system for this version of APPLEFONT is present, it will BLOAD the other three files, and connect HROUT to the standard character output routine. APPLEFONT2, the SuperFont Editor, is started with a CALL to 4096. From then on, the SuperFont Editor is in complete control except when it needs to access the disk drive. If you ask to load or save a character set, control returns to the BASIC program, the file is transferred using BASIC's disk access commands, and the SuperFont Editor program is CALLed again.

Using The SuperFont Editor

Characters are designed and edited on a grid that represents 32 (vertical) × 55 (horizontal) pixels. Each cell in the grid is a fourfold enlargement of actual size. Individual cells can be turned on (white) or off (black) with the bit-editing functions, and blocks of cells can be copied from one place to another on the screen. Patterns of 7 × 8 cells can be saved from the screen to the character set being edited with the Put command. The



The main editing screen of "Apple SuperFont," showing the design grid, an option menu, and the Apple's built-in character set (NORMAL.SET).

Get command does just the reverse, pulling a character from the character set onto the editing screen.

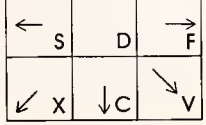
All of the features of the Editor are controlled with a series of four menus, entitled Bit Edit, Charsets, Utility, and Display. Each of these menus contains three to six selections. Only one menu is displayed on the screen at a time.

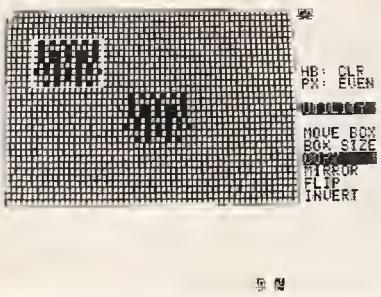
To change menus, press the space bar. The next menu title will be printed on the screen, along with its menu selections. The top selection will be printed in inverse characters to indicate that it has been chosen. To select a different menu item, use the left- and right-arrow keys. The large cursor bar moves up or down the menu to show you which selection is active.

Some menu items, like Clear Screen or Save Set, wait for you to press the RETURN key before performing their functions.

Three Cursors

You will be using three visually distinctive cursors in the SuperFont Editor: the bit cursor, the box cursor, and the character cursor. When a menu item is selected, one of the cursors may begin to flash, indicating that it can be moved. The cursors are controlled by a keypad centered on the D key:





Using the Copy command, you can duplicate shapes on the editing grid quickly and easily, as demonstrated with this Space Invaders*-type character.*

The bit cursor is a 1 × 1 cell box displayed on the editing screen. It flashes whenever the Bit Edit menu is displayed. Moving the bit cursor around on the editing screen sets (white) or clears (black) the cells that the cursor passes over. In other words, the bit cursor leaves a trail of black or white behind it. Selecting Black or White changes the color drawn when the bit cursor is moved. If you want to move the bit cursor without drawing on the screen, select the Move option.

The box cursor is a box displayed on the editing screen, but its size can be changed. It can be as small as a 1 × 1 cell, or as large as the entire editing screen. When you're using a utility such as Copy or Flip, the box cursor outlines the area on which the utility will operate. These utilities can be used on a character, part of a character, on shapes made up of several characters, or on a portion of a character, simply by changing the size of the box. Pressing the RETURN key when Flip is selected turns the contents of the box cursor upside down, and the Mirror function reverses left and right sides of the box. The Invert function changes all of the white cells inside the box to black cells, and all black cells to white. When Copy is selected, the cursor pad controls a second box cursor, which initially appears on top of the original box. Pressing the RETURN key copies the contents of the original box to the second box.

You can also use the box cursor to select the 7 × 8 cell character pattern for the Put and Get functions. The character cursor, located in the character set displayed at the bottom of the screen, flashes when the Get or Put function is selected. Use it to select the character that is the source of the Get or the destination of the Put.

The contents of the box cursor are displayed at actual size (one cell = one pixel) in the upper-right corner of the screen. Two parameters, HB and PX, affect how colors are presented. Pressing the RETURN key when the High Bit menu entry is selected changes the setting of HB. In Apple hi-res graphics, the status of seven one-bit pixels is stored in the lower seven bits of a byte in memory. The eighth bit, the most significant bit, controls the colors in which these bits will be drawn. When drawing on the high-resolution screen in BASIC, the high bit is clear when HCOLOR is between zero and three, and is set when HCOLOR is between four and seven. The display is in blue and orange when the high bit is set, or green and violet when the high bit is clear.

The Even/Odd menu entry controls whether this display starts on an even or an odd pixel (PX). When a shape is shifted by one bit, the colors in the display are reversed (blue for orange or green for violet). The alignment of the shape is changed by pressing RETURN when Even/Odd is selected.

At the bottom of the screen, all of the characters in a 96-character set are shown. With the RAM/ROM function in the Display menu, the character set displayed can be either the set you are currently editing or the hardware character set in your Apple. Get and Put operate only on the RAM character set no matter which set is being displayed.

HROUT, The Character Generator

Apple SuperFont uses a machine language graphics utility called HROUT, for high-resolution output. HROUT links into the standard character output vector and permits text to be displayed on either hi-res screen. Because the standard text output routine also remains active, the PRINT command, and any other text commands, can be used to create hi-res text. HROUT's only limitation is that it cannot perform screen scrolls at the bottom of the screen.

To use HROUT in your own programs, BLOAD it into memory. It can be loaded anywhere in memory, but to make things simpler, we'll use location $300. First, let HROUT know which character set to use by POKEing the address of the character set into locations 6 and 7, low byte first. If you put your character set at $8D00, the POKEs are:

```
POKE 6,0 : POKE 7,141
```

If you are using DOS 3.3, you can activate HROUT by entering:

```
POKE 54,0 : POKE 55,3 : CALL 1002
```

When in immediate mode, these commands have to be entered together on a multistatement

line (separated by colons). They can be on separate lines in a BASIC program, but the three commands should be executed one after another. Since locations 54 and 55 are being POKEd with the low and high bytes of the address of HROUT, these POKEs will be different if you put HROUT somewhere other than $300.

From ProDOS, it's easier to turn on HROUT. Just type

```
PR# A$300
```

Avoiding Screen Scrolls

Since HROUT concludes by calling the standard ROM routine for displaying a character on the text screen, all cursor control remains the same. You can move to any location on the screen by using the HTAB and VTAB commands. HOME still moves the cursor to the upper left of the screen, but will not clear the hi-res screen. To get the equivalent of a text HOME, use HOME : CALL −3092. The routine at −3092 clears the current hi-res screen and turns on hi-res graphics.

If you need to know what's where on the screen, you can PEEK to the text screen. By taking a couple of precautions, both text and hi-res screens should be the same. First of all, make sure that you clear both screens at the same time, as mentioned above. Second, don't let the text screen scroll. In order to make HROUT as small (88 bytes) and fast as possible, no provision was made for scrolling the screen. This could even be to your advantage for many applications, but you have to be careful if you want the text and graphics screens to agree.

The biggest problem arises when you print to the last character on the twenty-fourth line. Even if you follow the PRINT statement with a semicolon, the cursor will wrap onto the twenty-fifth line and the screen will scroll. There is a solution: Fool the computer into thinking the screen has 25 lines by using POKE 35,25. The output routine will then have no qualms at all about advancing the cursor to the twenty-fifth line, leaving it there, and even printing there. A lot of responsibility now rests on your shoulders, because the twenty-fifth line doesn't really exist. Printing something there is the same thing as POKEing out of the range of the text screen. That could cause significant problems.

If you change the text attribute with the INVERSE or FLASH commands, the bit patterns will be reversed before they are plotted on the screen, inverting the character. The NORMAL command also works, canceling inverted printing.

Now you can label high-resolution charts and graphs with a choice of any font, and you can design these fonts yourself with the Apple SuperFont Editor. Also, letters of the alphabet can become detailed shapes, permitting fast high-resolution game graphics in BASIC. In fact, we've started using this technique ourselves for some of the Apple games published in COMPUTE!.

Program 1: Apple SuperFont For DOS 3.3 (APPLEFONT)

```
100  IF  PEEK (978) <  > 157 THEN  PRINT
     "DOS 3.3 NOT FOUND": END
110  HGR
120 D$ =  CHR$ (4)
130  PRINT D$;"BLOAD HROUT"
140  PRINT D$;"BLOAD NORMAL.SET,A$8000"

150  POKE 6,0: POKE 7,141
160  POKE 54,0: POKE 55,3: CALL 1002
170  PRINT D$;"BLOAD APPLEFONT2":CE = 4
     096
180  ONERR  GOTO 280
190  CALL CE
200 NA$ = "":I = 14 * 256
210  IF  PEEK (I) = 141 THEN 260
220 NA$ = NA$ +  CHR$ ( PEEK (I)):I = I
      + 1: IF  PEEK (I) <  > 141 THEN 2
     20
230  IF  PEEK (14 * 256 + 32) THEN 250
240  PRINT D$;"BLOAD";NA$;",A$8A00": GOTO
     260
250  PRINT D$;"BSAVE";NA$;",A$8A00,L$30
     0"
260  GOSUB 320
270  CALL CE + 3: GOTO 200
280  GOSUB 320: VTAB 18: HTAB 1:EN =  PEEK
     (222)
290  IF EN = 6 OR EN = 7 THEN  PRINT "C
     OULDN'T FIND "NA$: GOTO 270
300  IF EN = 13 THEN  PRINT NA$" ISN'T
     A CHARACTER SET": GOTO 270
310  PRINT "DISK ERROR": GOTO 270
320  VTAB 18: HTAB 1: FOR I = 1 TO 80: PRINT
     " ";: NEXT : RETURN
```

Program 2: Apple SuperFont ProDOS Modifications

```
100  IF  PEEK (978) <  > 190 THEN  PRINT
     "PRODOS NOT FOUND": END
180  PRINT D$;"PR# A$300"
```

Program 3: Apple SuperFont Editor (APPLEFONT2)

```
1000- 4C 53 12 4C 6D 12 41 00
1008- 00 05 05 07 08 00 00 00
1010- 00 07 08 00 01 00 00 00
1018- 04 03 05 06 08 00 1A 50
1020- 82 00 01 00 00 00 00 00
1028- 00 00 00 00 00 00 00 04
1030- 00 00 00 A9 00 85 1C A9
1038- 20 85 E8 20 F6 F3 A9 02
1040- 20 09 1D A0 00 A2 00 18
1048- 20 00 1D A2 DC 20 03 1D
1050- C8 C8 C8 C8 C0 84 90 ED
1058- A2 00 A0 00 18 20 00 1D
1060- A0 80 20 06 1D E8 E8 E8
1088- E8 E0 E0 90 ED 60 A9 FF
1070- 85 32 A9 8A 85 07 A9 A0
1078- 8D 23 10 A0 15 98 20 5B
```

```
1080- FB A2 00 AD 23 10 86 24
1088- 20 ED FD EE 23 10 E8 E0
1090- 20 D0 F0 C8 C0 18 D0 E5
1098- A9 8D 85 07 60 20 56 1C
10A0- B9 00 0C CE 2D 10 30 05
10A8- 1D BA 1C D0 03 3D B2 1C
10B0- 99 00 0C EE 2D 10 AD 2D
10B8- 10 F0 02 A9 03 20 09 1D
10C0- 18 AD 2A 10 0A 0A AA E8
10C8- AD 2C 10 0A 0A A8 C8 18
10D0- 8A 20 02 11 20 02 11 20
10D8- 02 11 AD 2A 10 CD 09 10
10E0- 90 1F ED 0B 10 90 05 CD
10E8- 09 10 B0 15 AD 2C 10 CD
10F0- 0A 10 90 0D ED 0C 10 90
10F8- 05 CD 0A 10 B0 03 20 2B
1100- 11 60 20 00 1D E8 E8 20
1108- 03 1D AA C8 60 A9 00 A8
1110- 99 00 0C C8 D0 FA 20 56
1118- 11 60 20 56 1C B9 00 0C
1120- 3D BA 1C F0 02 A9 01 8D
1128- 2D 10 60 AD 2D 10 F0 02
1130- A9 03 18 6D 2F 10 20 09
1138- 1D AD 2C 10 38 ED 0A 10
1140- A8 A9 E0 38 ED 09 10 18
1148- 6D 2E 10 8D 2A 10 AA 20
1150- 00 1D 20 03 1D 60 AC 0A
1158- 10 8C 2C 10 A0 00 8C 23
1160- 10 AE 09 10 8E 2A 10 A2
1168- 00 8E 24 10 20 1A 11 20
1170- 2B 11 EE 2A 10 EE 24 10
1178- AE 24 10 EC 0B 10 D0 EC
1180- EE 2C 10 EE 23 10 AC 23
1188- 10 CC 0C 10 D0 D3 80 AD
1190- 27 10 F0 50 30 28 AD 09
1198- 10 18 6D 0B 10 E9 00 8D
11A0- 2A 10 AD 0A 10 8D 2C 10
11A8- AC 0C 10 8C 23 10 20 1A
11B0- 11 20 2B 11 EE 2C 10 CE
11B8- 23 10 D0 F2 F0 26 AD 09
11C0- 10 18 8D 0B 10 8D 2A 10
11C8- AD 0A 10 8D 2C 10 AC 0C
11D0- 10 8C 23 10 A9 00 8D 2D
11D8- 10 20 2B 11 EE 2C 10 CE
11E0- 23 10 10 F5 AD 28 10 F0
11E8- 4F 30 27 AD 0A 10 18 8D
11F0- 0C 10 E9 00 8D 2C 10 AD
11F8- 09 10 8D 2A 10 AC 0B 10
1200- 8C 23 10 20 1A 11 20 2B
1208- 11 EE 2A 10 CE 23 10 D0
1210- F2 60 AD 0A 10 18 6D 0C
1218- 10 8D 2C 10 AD 09 10 8D
1220- 2A 10 AC 0B 10 8C 23 10
1228- A9 00 8D 2D 10 20 2B 11
1230- EE 2A 10 CE 23 10 10 F5
1238- 80 AD 2F 10 20 09 1D A0
1240- 00 A2 E0 18 20 00 1D A2
1248- 17 38 20 03 1D C8 C0 20
1250- 90 EF 80 20 58 FC 20 33
1258- 10 20 1A 19 2C 52 C0 20
1260- 0D 11 A9 C1 8D 06 10 20
1268- 9E 1A 20 DA 1B 20 6E 10
1270- A9 00 8D 13 10 8D 27 10

1278- 8D 28 10 20 7D 19 AD 13
1280- 10 49 02 8D 13 10 A2 00
1288- A0 80 AD 00 C0 30 08 E8
1290- D0 F8 C8 D0 F5 10 E4 48
1298- A0 02 8C 13 10 20 7D 19
12A0- 68 2C 10 C0 C9 A0 D0 1B
12A8- AD 21 10 38 89 00 CD 18
12B0- 10 D0 02 A9 00 8D 21 10
12B8- A9 01 8D 22 10 20 9E 1A
12C0- 4C 01 13 C9 88 D0 17 AD
12C8- 22 10 18 E9 00 D0 06 AC
12D0- 21 10 B9 19 10 8D 22 10
12D8- 20 9E 1A 4C 01 13 C9 95
12E0- D0 1F AD 22 10 38 69 00
12E8- 8D 22 10 AC 21 10 B9 19
12F0- 10 CD 22 10 B0 05 A9 01
12F8- 8D 22 10 20 9E 1A 4C 01
1300- 13 C9 D7 D0 09 CE 27 10
1308- CE 28 10 4C 5A 13 C9 C5
1310- D0 06 CE 28 10 4C 5A 13
1318- C9 D2 D0 09 CE 28 10 EE
1320- 27 10 4C 5A 13 C9 D3 D0
1328- 06 CE 27 10 4C 5A 13 C9
1330- C6 D0 08 EE 27 10 4C 5A
1338- 13 C9 D8 D0 09 CE 27 10
1340- EE 28 10 4C 5A 13 C9 C3
1348- D0 06 EE 28 10 4C 5A 13
1350- C9 D6 D0 06 EE 28 10 EE
1358- 27 10 AE 21 10 D0 03 4C
1360- 75 13 CA D0 03 4C D5 13
1368- CA D0 03 4C C5 15 CA D0
1370- 03 4C 37 18 60 48 20 31
1378- 19 A9 01 8D 14 10 68 C9
1380- C4 F0 08 AD 27 10 0D 28
1388- 10 F0 47 AD 22 10 C9 03
1390- F0 14 69 FF 8D 2D 10 AD
1398- 07 10 8D 2A 10 AD 08 10
13A0- 8D 2C 10 20 9D 10 AD 07
13A8- 10 18 6D 27 10 C9 FF D0
13B0- 02 A9 38 C9 37 D0 02 A9
13B8- 00 8D 07 10 AD 08 10 18
13C0- 6D 28 10 C9 FF D0 02 A9
13C8- 1F C9 20 D0 02 A9 00 8D
13D0- 08 10 4C 70 12 48 AE 22
13D8- 10 CA D0 03 4C F8 13 CA
13E0- D0 03 4C 74 14 CA D0 03
13E8- 4C DA 14 CA D0 03 4C 55
13F0- 15 CA D0 03 4C 64 15 00
13F8- 20 31 19 A9 01 8D 15 10
1400- 20 3F 19 68 4C 70 12 20
1408- 31 19 A9 01 8D 16 10 AD
1410- 0B 10 CD 11 10 D0 08 AD
1418- 0C 10 CD 12 10 F0 2A AD
1420- 11 10 8D 0B 10 AD 12 10
1428- 8D 0C 10 20 39 12 20 56
1430- 11 AD 09 10 C9 31 90 05
1438- A9 30 8D 09 10 AD 0A 10
1440- C9 19 90 05 A9 18 8D 0A
1448- 10 AD 27 10 0D 28 10 F0
1450- 22 AD 28 10 F0 05 0A 0A
1458- 0A 0A 0A 18 6D 27 10 18
1460- 6D 06 10 C9 A0 10 02 69
```

```
1488- 60 C9 00 30 03 38 E9 60
1470- 8D 06 10 60 20 07 14 68
1478- C9 8D D0 5B 20 38 15 AD
1480- 0A 10 8D 2C 10 AD 0C 10
1488- 8D 24 10 A9 00 8D 31 10
1490- AD 09 10 8D 2A 10 AD 0B
1498- 10 8D 23 10 A9 00 8D 32
14A0- 10 20 1A 11 AD 2D 10 F0
14A8- 02 38 24 18 6E 32 10 EE
14B0- 2A 10 CE 23 10 D0 EA AD
14B8- 2F 10 F0 02 A9 80 6E 32
14C0- 10 0D 32 10 AC 31 10 91
14C8- 1A EE 2C 10 EE 31 10 CE
14D0- 24 10 D0 BC 20 6E 10 4C
14D8- 70 12 20 07 14 68 C9 8D
14E0- D0 53 20 38 15 AD 0A 10
14E8- 8D 2C 10 AD 0C 10 8D 24
14F0- 10 A9 00 8D 31 10 AD 09
14F8- 10 8D 2A 10 AD 0B 10 8D
1500- 23 10 AC 31 10 B1 1A 8D
1508- 32 10 4E 32 10 A9 00 89
1510- 00 8D 2D 10 20 9D 10 EE
1518- 2A 10 CE 23 10 D0 EB AD
1520- 32 10 0A 0A 8D 2F 10 EE
1528- 2C 10 EE 31 10 CE 24 10
1530- D0 C4 20 DA 1B 4C 70 12
1538- AD 06 10 38 E9 A0 85 1A
1540- A9 00 85 1B A2 03 06 1A
1548- 28 1B CA D0 F9 A5 1B 18
1550- 69 8A 85 1B 60 20 31 19
1558- 68 C9 8D D0 04 A9 00 F0
1560- 12 4C 70 12 20 31 19 68
1568- C9 8D D0 04 A9 01 D0 03
1570- 4C 70 12 8D 20 0E A9 A0
1578- A2 1F 9D 00 0E CA 10 FA
1580- A9 FF 85 32 A9 11 20 5B
1588- FB A9 00 85 24 A0 00 B9
1590- A7 15 F0 06 20 ED FD C8
1598- D0 F5 20 8A FD BD 00 02
15A0- 9D 00 0E CA 10 F7 60 C5
15A8- CE D4 C5 D2 A0 CE C1 CD
15B0- C5 A0 CF C6 A0 C3 C8 C1
15B8- D2 C1 C3 D4 C5 D2 A0 D3
15C0- C5 D4 BA 8D 00 48 AE 22
15C8- 10 CA D0 03 4C F8 13 CA
15D0- D0 03 4C EE 15 CA D0 03
15D8- 4C 37 18 CA D0 03 4C EB
15E0- 16 CA D0 03 4C 66 17 CA
15E8- D0 03 4C E1 17 00 20 31
15F0- 19 A9 01 8D 15 10 68 AD
15F8- 27 10 0D 28 10 F0 35 AD
1600- 27 10 18 6D 0B 10 D0 02
1608- A9 01 8D 0B 10 18 6D 09
1610- 10 C9 38 D0 03 CE 0B 10
1618- AD 28 10 18 6D 0C 10 D0
1620- 02 A9 01 8D 0C 10 18 6D
1628- 0A 10 C9 21 D0 03 CE 0C
1630- 10 20 8F 11 4C 70 12 20
1638- 31 19 A9 01 8D 17 10 AD
1840- 27 10 0D 28 10 F0 32 AD
1648- 27 10 18 6D 0D 10 10 02
1650- A9 00 8D 0D 10 18 8D 0F
1658- 10 C9 38 D0 03 CE 0D 10

1660- AD 28 10 18 6D 0E 10 10
1668- 02 A9 00 8D 0E 10 18 6D
1670- 10 10 C9 21 D0 03 CE 0E
1878- 10 68 C9 8D D0 6A 20 70
1680- 1C AD 0A 10 8D 23 10 AD
1688- 0E 10 8D 25 10 AD 09 10
1690- 8D 24 10 AD 0D 10 8D 26
1698- 10 AD 23 10 8D 2C 10 AD
16A0- 24 10 8D 2A 10 20 56 1C
16A8- B9 00 0D 3D BA 1C F0 02
16B0- A9 01 8D 2D 10 AD 25 10
16B8- 8D 2C 10 AD 26 10 8D 2A
18C0- 10 20 9D 10 EE 24 10 EE
18C8- 26 10 AD 09 10 18 6D 0B
18D0- 10 CD 24 10 D0 C3 EE 23
16D8- 10 EE 25 10 AD 0A 10 18
16E0- 6D 0C 10 CD 23 10 D0 A5
16E8- 4C 70 12 20 31 19 A9 01
18F0- 8D 15 10 20 3F 19 88 C9
18F8- 8D D0 88 20 70 1C AD 0A
1700- 10 8D 23 10 8D 25 10 AD
1708- 09 10 8D 24 10 18 6D 0B
1710- 10 E9 00 8D 26 10 AD 23
1718- 10 8D 2C 10 AD 24 10 8D
1720- 2A 10 20 58 1C B9 00 0D
1728- 3D BA 1C F0 02 A9 01 8D
1730- 2D 10 AD 25 10 8D 2C 10
1738- AD 28 10 8D 2A 10 20 9D
1740- 10 EE 24 10 AD 26 10 CD
1748- 09 10 F0 05 CE 28 10 B0
1750- C5 EE 23 10 EE 25 10 AD
1758- 0A 10 18 6D 0C 10 CD 25
1780- 10 D0 A4 4C 70 12 20 31
1768- 19 A9 01 8D 15 10 20 3F
1770- 19 68 C9 8D D0 68 20 70
1778- 1C AD 0A 10 8D 23 10 18
1780- 6D 0C 10 E9 00 8D 25 10
1788- AD 09 10 8D 24 10 8D 26
1790- 10 AD 23 10 8D 2C 10 AD
1798- 24 10 8D 2A 10 20 56 1C
17A0- B9 00 0D 3D BA 1C F0 02
17A8- A9 01 8D 2D 10 AD 25 10
17B0- 8D 2C 10 AD 26 10 8D 2A
17B8- 10 20 9D 10 EE 24 10 EE
17C0- 26 10 AD 09 10 18 6D 0B
17C8- 10 CD 24 10 D0 C3 EE 23
17D0- 10 AD 25 10 CD 0A 10 F0
17D8- 05 CE 25 10 B0 AA 4C 70
17E0- 12 20 31 19 A9 01 8D 15
17E8- 10 20 3F 19 68 C9 8D D0
17F0- 43 20 70 1C AD 0A 10 8D
17F8- 2C 10 AD 09 10 8D 2A 10
1800- 20 56 1C B9 00 0D 3D BA
1808- 1C D0 03 A9 01 2C A9 00
1810- 8D 2D 10 20 9D 10 EE 2A
1818- 10 AD 09 10 18 6D 0B 10
1820- CD 2A 10 D0 DB EE 2C 10
1828- AD 0A 10 18 6D 0C 10 CD
1830- 2C 10 D0 C6 4C 70 12 48
1838- 20 31 19 AE 22 10 CA D0
1840- 03 4C 63 18 CA D0 03 4C
1848- 7A 18 CA D0 03 4C 94 18
1850- CA D0 03 4C B2 18 CA D0
```

```
1858- 03 4C F2 18 CA D0 03 4C
1860- 0C 19 00 68 C9 8D D0 0F
1868- A9 04 38 ED 2F 10 8D 2F
1870- 10 20 56 11 20 DA 1B 4C
1878- 70 12 68 C9 8D D0 12 A9
1880- 01 38 ED 2E 10 8D 2E 10
1888- 20 39 12 20 56 11 20 DA
1890- 1B 4C 70 12 68 C9 8D D0
1898- 16 A9 01 38 ED 30 10 8D
18A0- 30 10 F0 05 2C 53 C0 B0
18A8- 06 2C 52 C0 20 DA 1B 4C
18B0- 70 12 A9 01 8D 15 10 20
18B8- 3F 19 68 C9 8D D0 30 A9
18C0- 00 8D 2D 10 AD 0A 10 8D
18C8- 2C 10 AD 0C 10 8D 23 10
18D0- AD 09 10 8D 2A 10 AD 0B
18D8- 10 8D 24 10 20 9D 10 EE
18E0- 2A 10 CE 24 10 D0 F5 EE
18E8- 2C 10 CE 23 10 D0 E1 4C
18F0- 70 12 68 C9 8D D0 12 20
18F8- 58 FC 20 33 10 20 9E 1A
1900- 20 6E 10 20 DA 1B 20 0D
1908- 11 4C 70 12 68 C9 8D D0
1910- 06 20 1A 19 20 6E 10 4C
1918- 70 12 A9 8A 85 1B A9 00
1920- 85 1A A2 03 A0 00 91 1A
1928- C8 D0 FB E6 1B CA D0 F6
1930- 60 48 A2 00 8A 9D 14 10
1938- E8 E0 04 90 F8 68 60 AD
1940- 27 10 0D 28 10 F0 35 AD
1948- 27 10 18 6D 09 10 10 02
1950- A9 00 8D 09 10 18 6D 0B
1958- 10 C9 38 D0 03 CE 09 10
1980- AD 28 10 18 6D 0A 10 10
1968- 02 A9 00 8D 0A 10 18 6D
1970- 0C 10 C9 21 D0 03 CE 0A
1978- 10 20 56 11 60 A9 00 20
1980- 09 1D AD 14 10 F0 06 AD
1988- 13 10 20 09 1D AD 07 10
1990- 0A 0A AA AD 08 10 0A 0A
1998- A8 18 20 00 1D 8A 89 04
19A0- AA 20 03 1D 98 69 04 A8
19A8- 20 06 1D 8A 38 E9 04 18
19B0- AA 20 03 1D 98 38 E9 04
19B8- A8 20 06 1D A9 00 20 09
19C0- 1D AD 15 10 F0 06 AD 13
19C8- 10 20 09 1D AD 09 10 0A
19D0- 0A AA AD 0A 10 0A 0A A8
19D8- 18 20 00 1D AD 09 10 6D
19E0- 0B 10 0A 0A AA 20 03 1D
19E8- AD 0A 10 6D 0C 10 0A 0A
19F0- A8 20 06 1D AD 09 10 0A
19F8- 0A AA 20 03 1D AD 0A 10
1A00- 0A 0A A8 20 06 1D A9 3F
1A08- 85 32 A9 8A 85 07 AD 06
1A10- 10 29 1F 85 24 AD 06 10
1A18- 29 60 A2 05 4A CA D0 FC
1A20- 69 14 20 5B FB AD 16 10
1A28- F0 09 AD 13 10 F0 04 A9
1A30- FF 85 32 AD 06 10 20 ED
1A38- FD A9 8D 85 07 AD 17 10
1A40- F0 43 AD 13 10 20 09 1D
1A48- AD 0D 10 0A 0A AA AD 0E
1A50- 10 0A 0A A8 18 20 00 1D
1A58- AD 0D 10 6D 0F 10 0A 0A
1A60- AA 20 03 1D AD 0E 10 6D
1A68- 10 10 0A 0A A8 20 06 1D
1A70- AD 0D 10 0A 0A AA 20 03
1A78- 1D AD 0E 10 0A 0A A8 20
1A80- 06 1D 4C 9D 1A AD 09 10
1A88- 8D 0D 10 AD 0A 10 8D 0E
1A90- 10 AD 0B 10 8D 0F 10 AD
1A98- 0C 10 8D 10 10 60 A9 08
1AA0- 20 5B FB A9 3F 85 32 AC
1AA8- 21 10 B9 19 10 8D 23 10
1AB0- 18 69 01 38 ED 22 10 8D
1AB8- 24 10 B9 1D 10 A8 20 FF
1AC0- 1A A9 8D 20 ED FD A9 FF
1AC8- 85 32 AD 24 10 CD 23 10
1AD0- D0 04 A9 3F 85 32 20 FF
1AD8- 1A CE 23 10 D0 E8 A9 FF
1AE0- 85 32 AC 21 10 AD 19 10
1AE8- 8D 23 10 A2 08 A9 20 85
1AF0- 24 20 11 1B EE 23 10 A9
1AF8- 08 CD 23 10 D0 ED 60 A2
1B00- 08 A9 20 85 24 B9 1F 1B
1B08- F0 07 20 ED FD CA C8 D0
1B10- F4 C8 E0 00 F0 08 A9 A0
1B18- 20 ED FD CA D0 FA 60 C2
1B20- C9 D4 A0 C5 C4 C9 D4 00
1B28- C2 CC C1 C3 CB 00 D7 C8
1B30- C9 D4 C5 00 CD CF D6 C5
1B38- 00 C3 C8 C1 D2 D3 C5 D4
1B40- D3 00 CD CF D6 C5 A0 C2
1B48- CF D8 00 D0 D5 D4 A0 C3
1B50- C8 C1 D2 00 C7 C5 D4 A0
1B58- C3 C8 C1 D2 00 CC CF C1
1B60- C4 A0 D3 C5 D4 00 D3 C1
1B68- D6 C5 A0 D3 C5 D4 00 D5
1B70- D4 C9 CC C9 D4 D9 00 CD
1B78- CF D6 C5 A0 C2 CF D8 00
1B80- C2 CF D8 A0 D3 C9 DA C5
1B88- 00 C3 CF D0 D9 00 CD C9
1B90- D2 D2 CF D2 00 C6 CC C9
1B98- D0 00 C9 CE D6 C5 D2 D4
1BA0- 00 C4 C9 D3 D0 CC C1 D9
1BA8- 00 C8 C9 A0 C2 C9 D4 00
1BB0- C5 D6 C5 CE AF CF C4 C4
1BB8- 00 D2 C1 CD AF D2 CF CD
1BC0- 00 C3 CC D2 A0 C2 CF D8
1BC8- 00 C3 CC D2 A0 D3 C3 D2
1BD0- CE 00 C3 CC D2 A0 D3 C5
1BD8- D4 00 A9 05 20 5B FB A9
1BE0- 20 85 24 A9 FF 85 32 A0
1BE8- 00 A9 04 20 2C 1C AD 2F
1BF0- 10 D0 09 A0 04 A9 03 20
1BF8- 2C 1C F0 07 A0 07 A9 03
1C00- 20 2C 1C A9 8D 20 ED FD
1C08- A9 20 85 24 A0 0A A9 04
1C10- 20 2C 1C AD 2E 10 D0 09
1C18- A0 0E A9 04 20 2C 1C F0
1C20- 0A A0 12 A9 04 20 2C 1C
1C28- AD 2E 10 60 8D 29 10 A2
1C30- 00 B9 3F 1C 20 ED FD C8
1C38- E8 EC 29 10 D0 F3 60 C8
1C40- C2 BA A0 C3 CC D2 D3 C5
```

```
1C48- D4 D0 D8 BA A0 C5 D8 C5
1C50- CE CF C4 C4 A0 00 AD 2A
1C58- 10 0A 0A 8D 2B 10 AD 2C
1C60- 10 29 07 AA AD 2C 10 4A
1C88- 4A 4A 18 8D 2B 10 A8 80
1C70- AD 0A 10 8D 2C 10 AD 0C
1C78- 10 8D 23 10 AD 09 10 8D
1C80- 2A 10 AD 0B 10 8D 24 10
1C88- 20 1A 11 B9 00 0D CE 2D
1C90- 10 30 05 1D BA 1C D0 03
1C98- 3D B2 1C 99 00 0D EE 2D
1CA0- 10 EE 2A 10 CE 24 10 D0
1CA8- DF EE 2C 10 CE 23 10 D0
1CB0- CB 60 FE FD FB F7 EF DF
1CB8- BF 7F 01 02 04 08 10 20
1CC0- 40 80 8D A0 A0 A0 A0 A0
1CC8- A0 A0 A0 A0 A0 A0 A0 A0
1CD0- A0 A0 A0 A0 A0 A0 A0 A0
1CD8- A0 A0 A0 A0 A0 A0 A0 A0
1CE0- A0 A0 00 FF 00 FF 00 FF
1CE8- 00 FF B7 FF 00 FF 00 FF
1CF0- 00 FF 00 FF 00 FF 00 FF
1CF8- 00 FF 00 FF 00 FF 00 FF
1D00- 4C 05 1F 4C 22 1E 4C C4
1D08- 1D 4C F6 1E 00 00 00 00
1D10- 00 00 00 00 00 A5 1C 51
1D18- 26 25 30 51 26 91 26 60
1D20- 85 45 86 46 84 47 60 A5
1D28- 45 A6 46 A4 47 60 A5 1C
1D30- 4A 4A 4A 4C 40 1D A5 1C
1D38- 4A 4C 40 1D A5 1C 4A 4A
1D40- 29 0F A8 B9 4F 1D 24 1C
1D48- 10 02 09 80 85 1C 60 00
1D50- 11 22 33 44 55 66 77 08
1D58- 19 2A 3B 4C 5D 6E 7F 00
1D60- 04 08 0C 10 14 18 1C 00
1D68- 04 08 0C 10 14 18 1C 01
1D70- 05 09 0D 11 15 19 1D 01
1D78- 05 09 0D 11 15 19 1D 02
1D80- 08 0A 0E 12 16 1A 1E 02
1D88- 06 0A 0E 12 16 1A 1E 03
1D90- 07 0B 0F 13 17 1B 1F 03
1D98- 07 0B 0F 13 17 1B 1F 81
1DA0- 82 84 88 90 A0 C0 81 83
1DA8- 87 8F 9F BF FF FF FE FC
1DB0- F8 F0 E0 C0 00 2A 55 7F
1DB8- 80 AA D5 FF 22 11 77 5D
1DC0- A2 91 F7 BB 08 20 20 1D
1DC8- C0 C0 90 03 4C B8 1F AC
1DD0- 0D 1D B9 9F 1D 85 30 A5
1DD8- 27 29 1F 05 E6 85 27 A5
1DE0- 47 38 ED 10 1D AA 6E 11
1DE8- 1D 10 17 E8 AC 0C 1D 20
1DF0- 15 1D CA F0 23 AD 11 1D
1DF8- 18 20 D3 F4 20 3C 1D 4C
1E00- EC 1D CA AC 0C 1D 20 15
1E08- 1D E8 F0 0C AD 11 1D 20
1E10- D3 F4 20 3C 1D 4C 03 1E
1E18- A5 47 8D 10 1D 20 27 1D
1E20- 28 60 08 20 20 1D 90 07
1E28- E0 18 90 03 4C B8 1F A0
1E30- 00 8C 0E 1D 8E 0F 1D 28
1E38- 08 90 03 EE 0E 1D A5 27
```

```
1E40- 29 1F 05 E6 85 27 AD 0F
1E48- 1D A2 E0 8E 12 1D AE 0E
1E50- 1D 8E 13 1D 4E 13 1D A2
1E58- 06 90 03 69 1F 38 2E 13
1E80- 1D CD 12 1D 90 08 EE 13
1E88- 1D ED 12 1D 4E 12 1D CA
1E70- D0 EC 8D 14 1D AE 0D 1D
1E78- AC 0C 1D CC 13 1D D0 1E
1E80- EC 14 1D 90 0B BD A6 1D
1E88- AE 14 1D 3D AD 1D B0 09
1E90- BD AD 1D AE 14 1D 3D A6
1E98- 1D 85 30 4C EB 1E 90 27
1EA0- BD A6 1D 85 30 20 15 1D
1EA8- 20 36 1D CE 0C 1D AC 0C
1EB0- 1D CC 13 1D F0 06 A5 1C
1EB8- 91 26 B0 EC AE 14 1D BD
1EC0- AD 1D 85 30 4C EB 1E BD
1EC8- AD 1D 85 30 20 15 1D 20
1ED0- 2E 1D EE 0C 1D AC 0C 1D
1ED8- CC 13 1D F0 06 A5 1C 91
1EE0- 26 90 EC AE 14 1D BD A6
1EE8- 1D 85 30 20 15 1D 8E 0D
1EF0- 1D 20 27 1D 28 60 08 20
1EF8- 20 1D 29 0F A8 B9 B4 1D
1F00- 85 1C 4C 9B 1F 08 20 20
1F08- 1D 90 07 E0 18 90 03 4C
1F10- B8 1F C0 C0 90 03 20 B8
1F18- 1F A9 01 2D 10 1D F0 03
1F20- 20 3C 1D A9 03 2D 0C 1D
1F28- F0 07 AA 20 36 1D CA D0
1F30- FA A5 47 8D 10 1D A5 46
1F38- 8D 0F 1D A0 00 8C 0E 1D
1F40- 28 08 90 03 EE 0E 1D 2C
1F48- 10 1D 10 02 A0 50 50 02
1F50- A0 28 84 28 A9 08 2D 10
1F58- 1D F0 08 A9 80 05 26 85
1F60- 26 AD 10 1D 29 3F A8 B9
1F68- 5F 1D 85 27 AD 0F 1D A2
1F70- E0 8E 12 1D AE 0E 1D 8E
1F78- 0C 1D 4E 0C 1D A2 06 90
1F80- 03 69 1F 38 2E 0C 1D CD
1F88- 12 1D 90 06 EE 0C 1D ED
1F90- 12 1D 4E 12 1D CA D0 EC
1F98- 8D 0D 1D A9 01 2D 10 1D
1FA0- F0 03 20 3C 1D A9 03 2D
1FA8- 0C 1D F0 07 AA 20 2E 1D
1FB0- CA D0 FA 20 27 1D 28 60
1FB8- A0 00 B9 C6 1F 20 ED FD
1FC0- C8 C0 19 D0 F5 00 D3 C3
1FC8- D2 C5 C5 CE A0 C2 CF D5
1FD0- CE C4 C1 D2 D9 A0 C5 D8
1FD8- C3 C5 C5 C4 C5 C4 8D 00
```

Program 4: Apple SuperFont NORMAL.SET

```
8D00- 00 00 00 00 00 00 00 00
8D08- 08 08 08 08 08 00 08 00
8D10- 14 14 14 00 00 00 00 00
8D18- 14 14 3E 14 3E 14 14 00
8D20- 08 3C 0A 1C 28 1E 08 00
8D28- 08 26 10 08 04 32 30 00
8D30- 04 0A 0A 04 2A 12 2C 00
8D38- 08 08 08 00 00 00 00 00
8D40- 08 04 02 02 02 04 08 00
```

```
8D48- 08 10 20 20 20 10 08 00
8D50- 08 2A 1C 08 1C 2A 08 00
8D58- 00 08 08 3E 08 08 00 00
8D60- 00 00 00 00 08 08 04 00
8D68- 00 00 00 3E 00 00 00 00
8D70- 00 00 00 00 00 00 08 00
8D78- 00 20 10 08 04 02 00 00
8D80- 1C 22 32 2A 26 22 1C 00
8D88- 08 0C 08 08 08 08 1C 00
8D90- 1C 22 20 18 04 02 3E 00
8D98- 3E 20 10 18 20 22 1C 00
8DA0- 10 18 14 12 3E 10 10 00
8DA8- 3E 02 1E 20 20 22 1C 00
8DB0- 38 04 02 1E 22 22 1C 00
8DB8- 3E 20 10 08 04 04 04 00
8DC0- 1C 22 22 1C 22 22 1C 00
8DC8- 1C 22 22 3C 20 10 0E 00
8DD0- 00 00 08 00 08 00 00 00
8DD8- 00 00 08 00 08 08 04 00
8DE0- 10 08 04 02 04 08 10 00
8DE8- 00 00 3E 00 3E 00 00 00
8DF0- 04 08 10 20 10 08 04 00
8DF8- 1C 22 10 08 08 00 08 00
8E00- 1C 22 2A 3A 1A 02 3C 00
8E08- 08 14 22 22 3E 22 22 00
8E10- 1E 22 22 1E 22 22 1E 00
8E18- 1C 22 02 02 02 22 1C 00
8E20- 1E 22 22 22 22 22 1E 00
8E28- 3E 02 02 1E 02 02 3E 00
8E30- 3E 02 02 1E 02 02 02 00
8E38- 3C 02 02 02 32 22 3C 00
8E40- 22 22 22 3E 22 22 22 00
8E48- 1C 08 08 08 08 08 1C 00
8E50- 20 20 20 20 20 22 1C 00
8E58- 22 12 0A 06 0A 12 22 00
8E60- 02 02 02 02 02 02 3E 00
8E68- 22 36 2A 2A 22 22 22 00
8E70- 22 22 26 2A 32 22 22 00
8E78- 1C 22 22 22 22 22 1C 00
8E80- 1E 22 22 1E 02 02 02 00
8E88- 1C 22 22 22 2A 12 2C 00
8E90- 1E 22 22 1E 0A 12 22 00
8E98- 1C 22 02 1C 20 22 1C 00
8EA0- 3E 08 08 08 08 08 08 00
8EA8- 22 22 22 22 22 22 1C 00
8EB0- 22 22 22 22 22 14 08 00
8EB8- 22 22 22 2A 2A 36 22 00
8EC0- 22 22 14 08 14 22 22 00
8EC8- 22 22 14 08 08 08 08 00
8ED0- 3E 20 10 08 04 02 3E 00
8ED8- 3E 06 06 06 06 06 3E 00
8EE0- 00 02 04 08 10 20 00 00
8EE8- 3E 30 30 30 30 30 3E 00
8EF0- 00 00 08 14 22 00 00 00
8EF8- 00 00 00 00 00 00 00 7F
8F00- 04 08 10 00 00 00 00 00
8F08- 00 00 1C 20 3C 22 3C 00
8F10- 02 02 1E 22 22 22 1E 00
8F18- 00 00 3C 02 02 02 3C 00
8F20- 20 20 3C 22 22 22 3C 00
8F28- 00 00 1C 22 3E 02 3C 00
8F30- 18 24 04 1E 04 04 04 00
8F38- 00 00 1C 22 22 3C 20 1C
8F40- 02 02 1E 22 22 22 22 00
8F48- 08 00 0C 08 08 08 1C 00
8F50- 10 00 18 10 10 10 12 0C
8F58- 02 02 22 12 0E 12 22 00
8F60- 0C 08 08 08 08 08 1C 00
8F68- 00 00 36 2A 2A 2A 22 00
8F70- 00 00 1E 22 22 22 22 00
8F78- 00 00 1C 22 22 22 1C 00
8F80- 00 00 1E 22 22 1E 02 02
8F88- 00 00 3C 22 22 3C 20 20
8F90- 00 00 3A 06 02 02 02 00
8F98- 00 00 3C 02 1C 20 1E 00
8FA0- 04 04 1E 04 04 24 18 00
8FA8- 00 00 22 22 22 32 2C 00
8FB0- 00 00 22 22 22 14 08 00
8FB8- 00 00 22 22 2A 2A 36 00
8FC0- 00 00 22 14 08 14 22 00
8FC8- 00 00 22 22 22 3C 20 1C
8FD0- 00 00 3E 10 08 04 3E 00
8FD8- 38 0C 0C 06 0C 0C 38 00
8FE0- 08 08 08 08 08 08 08 08
8FE8- 0E 18 18 30 18 18 0E 00
8FF0- 2C 1A 00 00 00 00 00 00
8FF8- 00 2A 14 2A 14 2A 00 00
```

Program 5: Apple SuperFont HROUT

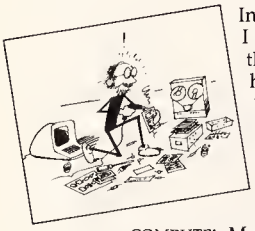
```
0300- D8 78 85 45 86 46 84 47
0308- A6 07 0A 0A B0 04 10 3E
0310- 30 04 10 01 E8 E8 0A 88
0318- 1B 18 85 06 85 1A 90 02
0320- E6 1B A5 28 85 08 A5 29
0328- 29 03 05 E6 85 09 A2 08
0330- A0 00 B1 1A 24 32 30 02
0338- 49 7F A4 24 91 08 E6 1A
0340- D0 02 E8 1B A5 09 18 89
0348- 04 85 09 CA D0 E2 A5 45
0350- A8 46 A4 47 58 4C F0 FD
```

Program 6: APPLEFONT2 Checksum

```
100  PRINT "CHECK THESE BLOCKS:";
110  FOR I = 8160 TO 8191: POKE I,0: NEXT
120  FOR I = 0 TO 83:S = 0
130  PRINT ".";
140  FOR J = 0 TO 83:S = S +  PEEK (409)
     6 + I * 64 + J): NEXT
150  READ A:S = S - 258 *  INT (S / 258
180 AD = 4098 + I * 64: GOSUB 200:A1$ =
     H$
170 AD = 4098 + I * 64 + 63: GOSUB 200:
     A2$ = H$
180  IF A <  > S THEN  PRINT : PRINT "$
     ";A1$;" TO $";A2$;
190  NEXT : END
200 H$ = "": FOR K = 0 TO 3:X =  INT (A
     D / 16):H$ =  MID$ ("0123456789ABC
     DEF",AD - X * 16 + 1,1) + H$:AD =
     X: NEXT : RETURN
210  DATA 33,182,119,1,233,214,30,116
220  DATA 36,37,152,145,189,208,216,189
230  DATA 60,127,70,70,155,173,185,120
240  DATA 74,176,171,163,153,216,210,16
250  DATA 191,187,202,174,159,187,87,125
260  DATA 41,199,222,202,111,195,52,127
270  DATA 178,145,237,65,215,171,8,97
280  DATA 123,137,102,120,22,29,223,142
```

The Home Computer Revolution: Another False Start?

Fred D'Ignazio, Associate Editor



In my recent columns I have written about the overselling of the home computer. (See "The Morning After: Anti-Computer Backlash And The Arrival Of The Mass-Market Home Computer," COMPUTE!, May and June 1984; and "Is The Computer A Home Appliance?," COMPUTE!, August 1984.)

Now it seems that a genuine backlash against home computers has appeared. In publication after publication, and on TV and radio, we hear that the "home computer revolution" was a fluke. Commentators and reporters tell us that computers are still too difficult, too finicky, and too expensive to be a mass-market "appliance." And, unlike the TV, the telephone, and the toaster oven, there is no compelling reason to own a computer.

There is some truth to all of these charges, and, collectively, they have chipped away at the glossy high-tech image that home computers have enjoyed for the last couple of years. As a result, the glamour has worn off the home computer, and this has caused the industry to sag.

History Repeats Itself

But this is not the first time it's happened. In 1975, when the first computer kit (the Altair) appeared, there was a lot of discussion in the media about a "home computer revolution." This discussion was short-lived, however, because the first computers were strictly hobbyist devices. They had very little memory, almost no software, and were not built, distributed, serviced, or supported as consumer products.

The home computer hype started again in 1977 when Apple introduced its Apple II, Radio Shack came out with the TRS-80 Model I, and Commodore introduced its PET. Again we heard claims about how computers would soon be in everyone's homes. Unfortunately, these claims were just as premature as they were before. Like the machines before them, these new computers were suitable only for hobbyists and students as do-it-yourself educational devices.

We are now at the end of a third wave of claims that the home computer has arrived. This wave, like the others, has subsided and turned sour because our computer technology is still not mature enough to create a true, mass-market consumer product.

There have been three false starts in launching the home computer revolution, and there are sure to be more. Home computers are now in five million homes, but they're used daily in only a minority of those homes. It will be a long time before computers appear in 100 percent of people's homes and become a way of life like telephones or TV sets.

Fred D'Ignazio is a computer enthusiast, the father of two children, and the author of several books on computers for young people. His books include Katie and the Computer *(Creative Computing),* Working Robots *(Hayden),* The Star Wars Question and Answer Book about Computers *(Random House), and* Computing Together: A Parents and Teachers Guide to Using Computers with Young Children *(COMPUTE! Publications).*

Fred appears regularly as the "family computing" commentator on "The New Tech Times," a half-hour public-TV program on consumer electronics that airs weekly on over 240 stations across the country.

Fred's column appears monthly in COMPUTE!.

The Digital Utility Center

Experts predict that a real home computer will not appear until computers are integrated into all aspects of people's lives, including banking, shopping, working, communicating, and entertainment. A real home computer will not sit alone on a desktop and look like a typewriter plugged into a TV set. Instead, it will be a hybrid machine—part TV, part telephone, part videocassette recorder, and part stereo system. It will be the brains of a general-purpose digital utility center that a family operates to hear music, watch movies and TV, make phone calls, control household appliances, and pay bills.

The home computer of the present is made up of awkward, ill-fitted, and confusing components. The day its components fuse together into a single digital utility center that is sold at discount supermarkets, it will truly become a mass-market device.

The digital utility center will come in a single box and plug into the wall with a single cord. The center's audio, video, and computer software will be uniform and standardized (in some kind of optical or magnetic format), and will play everything—from educational games to Bruce Springsteen to the latest Burt Reynolds movie.

All the recordings will be digital and capable of being stored on a single, high-density storage device. All programming will be in English and will consist of making simple choices from a menu of selections that appears on a screen and are read to the user aloud by the center's synthesized voice. Input will be from a keyboard, light pen, mouse, microphone, or touch screen, depending on the individual's preference. No technical knowledge whatsoever will be needed to operate the center. And the center will come with one- to five-year warranties, full service contracts, and modular, replaceable parts.

Like The Electric Motor

When the digital utility center arrives, the home computer will really be a mass-market appliance. But when computers have become digital utility centers, they will no longer be computers. To paraphrase Joseph Weizenbaum, a digital utility center to a computer is the same as a vacuum cleaner to an electric motor.

Before we see consumers going wild over digital utility centers, a lot of separate developments have to take place. Audio, video, communications, and computer hardware must evolve much further and become more integrated, digital, compatible, and inexpensive. Software for the separate devices has to be integrated under a single multimedia operating system and has to adopt a standardized storage and data interchange format.

In addition, the software must have a friendly, human-like mouthpiece that deals with us in our natural, spoken language and is not only user-friendly but also user-forgiving. The software will have to fill in the gaps in people's commands, correct their typos and misspellings, not let them make any serious mistakes, hold their hand as they work their way through a task, and anticipate what they will want to do next.

Most important of all, a mass-market home computer will require a reliable, universal communications network that links the digital utility center into very-high-speed satellite channels that support two-way instantaneous transmission of voices, music, video images, computer-generated pictures, text, and numerical data. This network, too, must be standardized, instantly available at the push of a CALL button on the digital utility center, and invisible to the user.

Only when such a network is in place will the digital utility center become popular with a majority of consumers. Only then will all the pie-in-the-sky promises of computer enthusiasts become possible.

Such a network will make it possible to do home banking, telecommuting, shopping at home, and attending courses and classes at home. People will be able to purchase all the new records, movies, computer software, and books over the network and have them downloaded into their local mass-storage device or into a portable computer that they can detach from the main unit and carry with them when they travel.

The Computer As Translator And Terminal

The lesson in all this is that our vision of the home computer has been too limited, and that's why we keep having false starts. Our vision has been limited by the fact that we are still too close to the computer's birth; we are still too familiar with the computer's early stages and functions to see what it may ultimately become.

We are only now beginning to move beyond the image of the computer as a computing engine that juggles numbers and processes paychecks. But we must go much further. We must see the computer as only a part of the digital revolution of all human media—voice, music, art, graphics, film, literature, and so on. As all science, art, technology, and communications are digitized, the computer assumes a central role as a translator among the media, and as a terminal linking human beings to the media and to each other.

The computer should enable the average person to enter information in any medium

(pictures, voice, text, whatever) and instantly translate it (at the discretion of the person) into any other medium—or into several different media. It should then enable the person to send the package to any other person. Likewise, anyone who uses a computer should have instant access to all media in any format they wish.

This sounds extremely abstract, so picture the home computer of the future as the United Nations Building. It will have two major functions: translator and terminal. It will house all the disparate streams of digitized information representing all the different media, and it will translate them back and forth at the needs and whims of the user. And it will be plugged into the outside world (of cultures, peoples, nations, and institutions) and capable of vital two-way communication with that world in any language that is appropriate.

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Modifications Or Corrections To Previous Articles

Atari Chess

Atari owners who use OSS DOS 2.20 from Optimized Systems Software must first select Q from the DOS menu to quit to DOS XL, then select T to go to cartridge before attempting to load this game from the December 1984 issue (p. 99).

Atari Acrobat

Due to a printing error in line 2030 of this game from the February 1985 issue (p. 60), the STRIG function to read the joystick button appears as STPIG. Also, lines 20115, 23500, and 27035 are too long to type in as listed. To enter these lines, simply omit all spaces between BASIC statements and variables. For example, POKE BC,14 can be typed as POKEBC,14.

Machine Language Multiplication

In Part 2 of the series on multiplication in the "Machine Language" column (p. 121, February 1985 issue), the high and low bytes of the product are switched in the example program. The last few instructions of the example should read as follows:

```
        LDA   $0380
        ADC   $0382
        STA   $0380
        LDA   $0381
        ADC   #$00
        STA   $0381
NOADD   DEX
        BNE   NXBIT
```

Thanks to Karl Schmitt, Norman Sprock, and other readers who wrote in with the correction.

IBM Illegal Function Errors

A number of readers have reported problems with illegal function call errors in COMPUTE!'s graphics games for the IBM, such as "Horse Racing" (October 1984) and "Paratrooper" (January 1985). If you receive an Illegal Function Call error message in a line containing a PUT statement (such as line 1220 of Paratrooper), it most likely means that you have made a typing error in the DATA statements that define the graphics displayed by the PUT. When you see that error message in a line involving PUT, check all your DATA items carefully.

Proofreading The IBM Proofreader

Many readers have had problems getting the "IBM Automatic Proofreader" to work properly. The program is correct as listed, but if it's not typed in correctly, you may receive the cryptic message Error #2. The Proofreader traps all errors, even syntax errors. Instead of getting the usual "Syntax error in ..." message, you get the error number (2 is syntax error) with no hint as to where the error might be. To help you find your typos, change the 650 in line 140 to 0. This turns off the error trapping so you'll get the usual error messages if you have any errors.

Before using the Proofreader to type in programs, it's a good idea to test all the Proofreader commands, especially the SAVE command, just to make sure there are no bugs lurking in some obscure place in the program. To test the Proofreader's SAVE command, run the Proofreader and type in one line, say 10 REM. Now save this test program. If you didn't get an error message, you can safely type in a complete listing without fear of losing all your typing due to a bug in the SAVE command. When you think you have all the bugs out, type BASIC to exit the Proofreader, change line 140 back to normal, and save this bug-free version of the Proofreader.

David D. Thornburg, Associate Editor

Visual Computing, Part 1

In January 1984 Apple launched the Macintosh—a computer that would accelerate a revolution in computing that had already been gathering momentum for some time. This revolution was not in the computer hardware itself, although this certainly played a role. The revolution was in the way we communicate with our computational technology.

The Macintosh was the first low-cost personal computer to incorporate a primarily pictorial user interface. Rather than having to deal with words and phrases to convey information or desires to the computer, you can select small images (icons) that represent the object with which you want to work. To edit a document with the word processor, for example, you simply place the cursor over the document (shown as a page with a label beneath it) using a pointing device called a mouse. Once the cursor is over the document, two clicks of the mouse is all that's needed to load the document (and the word processor!) into the computer.

The difference between loading a program or text file in this fashion and loading it in by typing commands from the keyboard is subtle. To understand the nature of this difference, and why the visual interface appeals to some users and not to others, we need to explore different ways that people "think."

David D. Thornburg feels comfortable working across the text-picture boundary, and has written a dozen books on computing, including the KoalaPad Book *(Addison-Wesley) and* 101 Ways to Use a Macintosh *(Random House). His most recent book,* Beyond Turtle Graphics, *describes the nongraphics aspects of the computer language Logo. This book is an introduction to artificial intelligence and will be available soon from Addison-Wesley. Thornburg is currently working on his first novel.*

The Two Brains

Several years ago it was in vogue to think of human thinking style as being lateralized to the two hemispheres of the brain. Thinking that takes place in the left hemisphere is linear and analytical. Thinking that takes place in the right hemisphere is parallel, visual, and creative. This model of mental activity became so popular that we found ourselves referring to artists as "right-brained" people and to analytical thinkers as being "left-brained."

In fact, we all have the ability to think with both sides of our brain—to be both analytical and to be creative—to think linearly and in parallel. It is true that many of us spend more time in one mode of thought than the other. It is also true that our society seems to develop and encourage our analytical linear thinking at the expense of our creative mind. But it is both unfair and inaccurate to suggest that any individual is purely "left-brained" or "right-brained."

When interactive computer systems were first developed for mass production, it was decided that people should communicate with these machines through the typewriter keyboard and that the computer should respond primarily through a text-based display. Interestingly, the dedicated videogame computers that were being developed at the same time chose to use non-keyboard devices such as joysticks and game paddles instead of the keyboard, and to produce colorful graphic images rather than text displays.

Anyone who remembers the fads of the late 1970s will recall that videogame consoles outsold personal computers many times over. This extremely high ratio of game to computer sales was not based on price alone. The fact was that purchasers of game machines knew exactly what to do with them as soon as they were plugged in. The videogame was extremely easy to use—intuitively easy, perhaps.

Nothing Automatic

Personal computers, on the other hand, seemed designed for the linear analytical mode of thought. Nothing happened automatically—the keyboard had to be used for everything, including loading a program in the first place.

For example, suppose we look at the process of starting a game with the Atari 2600 Video Computer System and with the Commodore 64 computer. In the case of the Atari game machine, one needs only to insert the game cartridge and switch on the power. While this same process applies to the Commodore 64 with cartridge games, the story is quite different when the program is provided on disk. You then must enter:

```
LOAD "*",8
RUN
```

to get the game into the computer.

This difference in the user interface has nothing to do with technology differences between the two machines. The fact that the Commodore 64 has more RAM, or a disk drive, or can be used with thousands of different programs, is not the issue. In fact, most personal computer users expect to have to type strings of textual information into their computer to make it do something useful.

Mainly The Keyboard

For those of us who have used computers for a long time, none of this represents any hardship—it is simply "how things are done." Of course we are happy when the interface is simplified. Almost all Apple II owners, for example, equip their computers with "autostart ROMs" that will let a program boot from the disk automatically when the computer is turned on.

But still, the keyboard has maintained its role as the primary communication tool, even when the information to be communicated is nontextual.

This restriction in interface technology has kept many people from using computers. A major typing tutor program was promoted with the slogan "If you can't type you can't compute." For the vast majority of potential computer users in the world, this amounts to disfranchisement.

Fortunately, the slogan was wrong. Typing has nothing whatsoever to do with computing. All that is needed is a variety of communication tools across the man-machine interface to make computers accessible to any who would want to use them.

What made the Macintosh different was that it provided another type of interface—one that was primarily visual rather than textual.

A Step Back?

Of course, there are critics who would argue that the visual interface is a giant step backwards—that we gave up iconographic writing many years ago in favor of building words from an alphabet of letters. These same people might argue that those cultures whose language is still recorded in iconographic form are burdened with a cumbersome writing system that has hampered their development.

The visual computer interface has nothing to do with how we write. I am not arguing that we should do away with our alphabet or with words or with writing. I am not suggesting that we should use nothing but pictures in our next letter to Aunt Elsinore. What I am suggesting is that, when we are referring to the operations to be performed by a computer, it is only a matter of convention that we refer to these operations in written form. The convention to build programming languages from a vocabulary of English words was completely arbitrary. It was done, in part, because computer systems were provided with keyboards.

In fact, the first computer programs devised by Lady Lovelace for Babbage's Analytical Engine were patterns of holes in punched cards.

Any Symbols Will Do

Because most of us don't think of programming as a nontextual activity, it is hard for us to realize that one can communicate information to a computer in many different ways. A computer is, after all, just a symbol manipulation tool. The use of letters and numbers as symbols is arbitrary—it could work as easily with any other symbols we may devise.

The reason for exploring this topic at all is simple: Without being consciously aware of it, we have been overtaken by symbolic nontextual programming languages and have embraced them wholeheartedly. We have, in fact, become a nation of programmers without knowing it.

Anyone who builds a new level of *Lode Runner*, designs a new game with *Pinball Construction Set*, creates a new spreadsheet with *Multiplan*, or who works with any of the myriad construction set systems that represent one of the best-selling classes of software that has ever existed, is, in fact, creating computer programs with a minimum of typing. In fact, many of these programs are created by people with no typing whatsoever.

So, it is mildly amusing to hear many of these same construction set users suggest that programming is a "typing" activity.

Free Choice

Again, it is not typing that is the issue. I will argue that the nature of our communication medium determines the nature of the ideas we

communicate. Some of us express ourselves quite well in linear textual form, and others of us are more comfortable with pictures and diagrams. There is nothing wrong with either approach to expression. What is important is that our technology has advanced to the point where people are free to choose their communication form, and even to switch back and forth between the two if they so desire. Any choice between the two has to be based on personal preference, not on the assumption that there is one "right" way to communicate.

Judging from the popularity of the visual interface (there is even a version of a Macintosh-like graphics program available for the PCjr!), the development of visual interfaces is opening up computer access to many thousands of people who would never have otherwise been interested in using this technology.

But, just because this new communication mode has been made available to the general public, this is no reason to think that we already know all of its consequences. As I gaze into my cloudy crystal ball, I see a future in which much of our programming will be done without the labor of typing—where we will write programs by constructing flow charts that indicate graphically what it is we want the computer to do for us.

These visual programming environments will let us express a goal without also requiring that we tell the computer how to achieve that goal.

Next month we will explore a visual programming environment in depth and compare it to text-based programming. Our visual programming language will be the database language HELIX, developed by Odesta for the Macintosh. ©

IBM Personal Computing

Donald B. Trivette

Spreadsheets For The Home

Remember when you were growing up and your pals used a word you'd never heard before? Were you too embarrassed to ask for a definition—to admit you didn't know what they were talking about (and maybe even doing)? Did you fake it as best you could?

Now that you're an adult, are you still faking? Do you really know what a *spreadsheet* program is? Don't be embarrassed. There are lots of well-adjusted, computer-literate people who have only a vague notion of what spreadsheet software is all about. You may have thought that spreadsheets were something only an accountant could appreciate and understand. Not true. Although spreadsheets *were* born of the accounting world, they have dozens of uses for those of us who have trouble balancing a checkbook. Yes, spreadsheets can actually be fun. First we'll look at their fascinating history, then at a typical numerical spreadsheet, and finally at some unusual nonnumerical applications.

Let There Be *VisiCalc*

It can be argued that the personal computer era really began with the invention of spreadsheet software. Before then, a few personal computers were around, but most were owned and used by hobbyists and tinkerers. In general, personal computer software was primitive in those days—back in the late 1970s.

It was in 1978 that Dan Bricklin was sitting in a classroom at Harvard Business School watching his professor laboriously create a model budget on the blackboard. Every time the professor changed a number in one column, all the related numbers in the other columns had to be recalculated and changed, too. (This is a familiar concept to those who adjust their income tax returns until they fall into the lowest possible tax bracket.)

Suddenly, in a flash (lightning striking and all that), Bricklin imagined an *electronic* blackboard that would, when one number was changed, automatically recalculate all the other numbers derived from it. Was such a thing possible? Bricklin didn't know, but he took the idea to his neighbor and friend Robert Frankston. Frankston, an experienced computer programmer and designer, was at first reluctant but finally agreed to pursue the project along with Dan Fylstra, a fledgling software publisher. Thus was born *VisiCalc*, the visible calculator.

The first *VisiCalc* program was sold in January 1979; it ran on a 24K RAM Apple II computer. The *VisiCalc* program was so useful that it helped sell Apple computers, and Apple in turn promoted *VisiCalc*—software that in essence turned a computer screen into an electronic blackboard for budget planning, financial forecasting, and virtually any task involving columns and rows of data. Nothing succeeds like a best-selling computer program, and it wasn't long before a dozen other companies were marketing spreadsheet programs, too. (Mercifully some are no longer with us.)

Today, there are spreadsheet programs for virtually every business, personal, and home computer. *VisiCalc* lives on in a much improved version that is available for several machines; *Multiplan* is another favorite; and *Lotus 1-2-3*, an integrated package that includes a spreadsheet, is one of the most popular computer programs of all time.

A Screenful Of Cells

A look at an actual spreadsheet application will help you grasp what Bricklin hath wrought. All spreadsheet programs start with a screen that looks like the blank spreadsheet in Figure 1. The columns, across the top, are lettered; the rows, down the edge, are numbered. The maximum size of the spreadsheet—the number of rows and columns—depends on the program and the amount of memory in the computer.

Each combination of a row and column forms a *cell* or box where data may be entered. Thus, the upper-left cell is referred to as A1—column A, row 1. The current cell—the place the computer will put the data when you type—is usually shown as a white box. That box is the spreadsheet's cursor. Just like a regular cursor, it can be moved up and down, left and right, by the arrow keys on the computer's keyboard.

Figure 1: Typical Spreadsheet Layout

	A	B	C	D	E	F
1						
2						
3						
4						
5						
6						
7						

Let's create a supersimple spreadsheet for a make-believe company. An entry in a spreadsheet cell may be one of three types: characters, numbers, or a formula which the program will turn into numbers. By typing characters in some cells, you can create headings. In other cells—B3, B4, B5, B7—we'll put numbers to represent sales. As always when entering numbers in a computer program, omit the commas. (See Figure 2.)

To get the subtotal for divisional sales, you don't add the numbers manually and enter the result. That would defeat the purpose of the spreadsheet. Instead, you tell the computer to do it for you—to always add up column B, row 3, row 4, and row 5 and then put the total in column B, row 6. You do that by typing the *formula*—instead of a *number*—directly in the cell. The exact format differs slightly from one spreadsheet program to another, but generally you'd type B3+B4+B5 in cell B6. That is, B6 is always the sum of B3, B4, and B5. Makes sense, doesn't it?

Figure 2: A Sample Spreadsheet

	A	B	C
1		January	February
2	Sales		
3	Division 1	1000.00	
4	Division 2	1400.00	
5	Division 3	5000.00	
6	Subtotal	7400.00	
7	Mail Order	1200.00	
8	Grand Total	8600.00	

Figure 2 doesn't show the formula in cell B6—it only shows the value that the formula has calculated. The actual formula for any cell may

be displayed at the top of the spreadsheet, but it is invisible in the spreadsheet itself. A similar formula is entered in cell B8 for the grand total.

Next, let's say you want to estimate the sales for February through December. Just enter a formula in the February cell C3. We'll project that each of the three divisions will sell a half-percent more than in the previous month. For example, C3 will be B3 multiplied by 1.005. There's a way to enter a formula so that it's automatically repeated for every month that remains in the year. And there's a way to copy a formula from one row to another, so only a few keystrokes are needed to generate the spreadsheet in Figure 3.

Figure 3: Projecting Sales With A Spreadsheet

	A	B	C
1		January	February
2	Sales		
3	Division 1	1000.00	1005.00
4	Division 2	1400.00	1407.00
5	Division 3	5000.00	5025.00
6	Subtotal	7400.00	7437.00
7	Mail Order	1200.00	1206.00
8	Grand Total	8600.00	8643.00

Spreadsheets As Big As Bedsheets

There's more to most spreadsheets than can be shown on a screen. In our sample, the columns for March through December will scroll into view when we move the cursor to the right side of the screen; similarly, rows below the "Grand Total" label can be scrolled into view. The screen is just a window onto a portion of the spreadsheet.

Most spreadsheet programs have commands to delete and insert rows and columns, to move entire rows and columns to other locations, to make hardcopy printouts, and to save the spreadsheet on disk.

Now, here's what makes spreadsheets so wonderful: To see how the numbers change when Division 2 sales increase, all you have to do is move the cursor to B4 and enter a new number. Instantly, the subtotal in B6 and the grand total in B8 are recalculated and replaced in the spreadsheet. Since a change in B4 alters some of the numbers for February through December, the spreadsheet automatically recalculates those values, too.

This is a typical numerical spreadsheet. But spreadsheets can also be useful and fun even for those who hate math. I know one woman who uses a spreadsheet to record her family tree. Each cell represents one of her ancestors; each column is a generation. Her spreadsheet has no formulas or mathematical calculations—just lots of names and dates. (See Figure 4.)

Some folks use spreadsheets in place of word processing programs. My architect friend uses *Lotus 1-2-3* to compose and print the schedules on his blueprints. He says it's much faster and easier than using a word processor. Once the schedule is entered, he prints it on a transparent film instead of paper and then sticks it to the drawing. He does schedules for doors, hardware, electrical fixtures, plumbing fixtures, and even shrubbery. Figure 5 shows part of a shrubbery schedule.

You could use a schedule like this to keep track of when you fertilized your plants, and what kind of fertilizer you used. Or to keep an inventory of your wine cellar. Or to record the expiration dates of your magazine subscriptions (especially if, like me, you think the magazines are always wrong). In fact, spreadsheet programs are ideal for any situation where you need to organize and record data in lists or tables.

Figure 4: Family Tree Spreadsheet

	A	B	C
1			
2		Helen (1840–1841)	
3			
4	John Smith (1810–1880)	John, Jr. (1850–1865)	
5	m. Mary Jones (1820–1860)		
6		Tim (1860–1930)	John Mason (1885–1914)
7		m. Betty Mason (1865–1925)	m. Sara Penny (1890–1964)

Figure 5: Shrubbery-Scheduling Spreadsheet

	A	B	C	D
1	Plant Name	Quantity	Height	Remarks
2	Pittosporum tobria	24	6′ 0″	Plant on centers shown
3	Juniperus conferta	30	12′ 15″	Plant on 3′ centers
4	Yeddo-Hawthorne	10	6′ 0″	Furnished by owner
5	Yucca gloriosa	15	24′ 30″	Transplant from corner

MLX Machine Language Entry Program For VIC-20

Charles Brannon, Program Editor

MLX is a labor-saving utility that allows almost fail-safe entry of machine language programs published in COMPUTE!. You need to know nothing about machine language to use MLX—it was designed for everyone. At least 8K expansion memory is required.

MLX is a new way to enter long machine language (ML) programs with a minimum of fuss. MLX lets you enter the numbers from a special list that looks similar to BASIC DATA statements. It checks your typing on a line-by-line basis. It won't let you enter illegal characters when you should be typing numbers. It won't let you enter numbers greater than 255 (forbidden in ML). It won't let you enter the wrong numbers on the wrong line. In addition, MLX creates a ready-to-use tape or disk file.

Using MLX

Type in and save the appropriate version of MLX (you'll want to use it in the future). When you're ready to type in an ML program, run MLX. MLX asks you for two numbers: the starting address and the ending address. These numbers are given in the article accompanying the ML program.

When you run MLX, you'll see a prompt corresponding to the starting address. The prompt is the current line you are entering from the listing. It increases by six each time you enter a line. That's because each line has seven numbers—six actual data numbers plus a *checksum number*. The checksum verifies that you typed the previous six numbers correctly. If you enter any of the six numbers wrong, or enter the checksum wrong, the computer rings a buzzer and prompts you to reenter the line. If you enter it correctly, a bell tone sounds and you continue to the next line.

MLX accepts only numbers as input. If you make a typing error, press the INST/DEL key; the entire number is deleted. You can press it as many times as necessary back to the start of the line. If you enter three-digit numbers as listed, the computer automatically prints the comma and goes on to accept the next number. If you enter less than three digits, you can press either the space bar or RETURN key to advance to the next number. The checksum automatically appears in inverse video for emphasis.

To simplify your typing, MLX redefines part of the keyboard as a numeric keypad (lines 581–584):

```
    U  I  O           7  8  9
H   J  K  L  become  0  4  5  6
    M  ,  .           1  2  3
```

MLX Commands

When you finish typing an ML listing (assuming you type it all in one session), you can then save the completed program on tape or disk. Follow the screen instructions. If you get any errors while saving, you probably have a bad disk, or the disk is full, or you've made a typo when entering the MLX program itself.

You don't have to enter the whole ML program in one sitting. MLX lets you enter as much as you want, save it, and then reload the file from tape or disk later. MLX recognizes these commands:

SHIFT-S: Save
SHIFT-L: Load
SHIFT-N: New Address
SHIFT-D: Display

When you enter a command, MLX jumps out of the line you've been typing, so we recommend you do it at a new prompt. Use the Save command to save what you've been working on. It will save on tape or disk, as if you've finished, but the tape or disk won't work, of course, until you finish the typing. Remember what address you stop at. The next time you run MLX, answer all the prompts as you did before, then insert the disk or tape. When you get to the entry prompt, press SHIFT-L to reload the partly completed file into memory. Then use the New Address command to resume typing.

To use the New Address command, press SHIFT-N and enter the address where you previously stopped. The prompt will change, and you can then continue typing. Always enter a New Address that matches up with one of the line numbers in the special listing, or else the checksum won't work. The Display command lets you display a section of your typing. After you press SHIFT-D, enter two addresses within the line number range of the listing. You can abort the listing by pressing any key.

VIC MLX: Machine Language Entry

```
100 PRINT"{CLR}{PUR}";CHR$(142);CHR$(8);
                                    :rem 181
101 POKE 788,194:REM DISABLE RUN/STOP
                                    :rem 174
110 PRINT"{RVS}{14 SPACES}"         :rem 117
120 PRINT"{RVS} {RIGHT}{OFF}£{*}£{RVS}
    {RIGHT} {RIGHT}{2 SPACES}£{*}£{OFF}£{*}
    £{RVS}£{RVS} "                  :rem 191
130 PRINT"{RVS} {RIGHT} £G}{RIGHT}
    {2 RIGHT} {OFF}£{RVS}££{*}£{OFF}£{*}
    {RVS} "                         :rem 232
140 PRINT"{RVS}{14 SPACES}"         :rem 120
```

```
200 PRINT"{2 DOWN}{PUR}{BLK}A FAILSAFE MA
    CHINE":PRINT"LANGUAGE EDITOR{5 DOWN}"
                                    :rem 141
210 PRINT"{8LK}{3 UP}STARTING ADDRESS":IN
    PUTS:F=1-F:C$=CHR$(31+119*F)   :rem 97
220 IFS<256ORS>32767THENGOSUB3000:GOTO210
                                    :rem 2
225 PRINT:PRINT:PRINT:PRINT        :rem 123
230 PRINT"{8LK}{3 UP}ENDING ADDRESS":INPU
    TE:F=1-F:C$=CHR$(31+119*F)     :rem 158
240 IFE<256ORE>32767THENGOSUB3000:GOTO230
                                    :rem 234
250 IFE<STHENPRINTC$;"{RVS}ENDING < START
    {2 SPACES}":GOSUB1000:GOTO 230 :rem 176
260 PRINT:PRINT:PRINT              :rem 179
300 PRINT"{CLR}";CHR$(14):AD=S     :rem 56
310 PRINTRIGHT$("0000"+MID$(STR$(AD),2),5
    );":";:FORJ=1TO6               :rem 234
320 GOSUB8570:IFN=-1THENJ=J+N:GOTO320
                                    :rem 228
390 IFN=-211THEN 710               :rem 62
400 IFN=-204THEN 790               :rem 64
410 IFN=-206THENPRINT:INPUT"{DOWN}ENTER N
    EW ADDRESS";ZZ                 :rem 44
415 IFN=-206THENIFZZ<SORZZ>ETHENPRINT"
    {RVS}OUT OF RANGE":GOSUB1000:GOTO410
                                    :rem 225
417 IFN=-206THENAD=ZZ:PRINT:GOTO310
                                    :rem 238
420 IF N<>-196 THEN 480            :rem 133
430 PRINT:INPUT"DISPLAY:FROM";F:PRINT,"TO
    ";:INPUTT                      :rem 234
440 IFF<SORF>EORT<SORT>ETHENPRINT"AT LEAS
    T";S;"{LEFT}, NOT MORE THAN";E:GOTO43
    0                              :rem 159
450 FORI=FTOTSTEP6:PRINT:PRINTRIGHT$("000
    0"+MID$(STR$(I),2),5);":";     :rem 30
455 FORK=0TO5:N=PEEK(I+K):IFK=3THENPRINTS
    PC(10);                        :rem 34
457 PRINTRIGHT$("00"+MID$(STR$(N),2),3);"
    ,";                            :rem 157
460 GETA$:IFA$>""THENPRINT:PRINT:GOTO310
                                    :rem 25
470 NEXTK:PRINTCHR$(20);:NEXTI:PRINT:PRIN
    T:GOTO310                      :rem 50
480 IFN<0 THEN PRINT:GOTO310       :rem 168
490 A(J)=N:NEXTJ                   :rem 199
500 CKSUM=AD-INT(AD/256)*256:FORI=1TO6:CK
    SUM=(CKSUM+A(I))AND255:NEXT    :rem 200
510 PRINTCHR$(18);:GOSUB570:PRINTCHR$(20)
                                    :rem 234
515 IFN=CKSUMTHEN530               :rem 255
520 PRINT:PRINT"LINE ENTERED WRONG":PRINT
    "RE-ENTER":PRINT:GOSUB1000:GOTO310
                                    :rem 129
530 GOSUB2000                      :rem 218
540 FORI=1TO6:POKEAD+I-1,A(I):NEXT:rem 80
550 AD=AD+6:IF AD<E THEN 310       :rem 212
560 GOTO 710                       :rem 108
570 N=0:Z=0                         :rem 88
580 PRINT"[+3";                     :rem 79
581 GETA$:IFA$=""THEN581           :rem 95
585 PRINTCHR$(20);:A=ASC(A$):IFA=13ORA=44
    ORA=32THEN670                  :rem 229
590 IFA>128THENN=-A:RETURN         :rem 137
600 IFA<>20 THEN 630               :rem 10
610 GOSUB690:IFI=1ANDT=44THENN=-1:PRINT"
    {LEFT} {LEFT}";:GOTO690        :rem 172
620 GOTO570                        :rem 109
630 IFA<48ORA>57THEN580            :rem 105
640 PRINTA$;:N=N*10+A-48           :rem 106
650 IFN>255 THEN A=20:GOSUB1000:GOTO600
                                    :rem 229
660 Z=Z+1:IFZ<3THEN580             :rem 71
670 IFZ=0THENGOSUB1000:GOTO570     :rem 114
680 PRINT",";:RETURN               :rem 240
690 S%=PEEK(209)+256*PEEK(210)+PEEK(211)
                                    :rem 149
692 FORI=1TO3:T=PEEK(S%-I)         :rem 68
695 IFT<>44ANDT<>58THENPOKES%-I,32:NEXT
                                    :rem 205
700 PRINTLEFT$("{3 LEFT}",I-1);:RETURN
                                    :rem 7
710 PRINT"{CLR}{RVS}*** SAVE ***{3 DOWN}"
                                    :rem 236
720 INPUT"{DOWN} FILENAME";F$      :rem 228
730 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
    {RVS}D{OFF}ISK: (T/D)"         :rem 228
740 GETA$:IFA$<>"T"ANDA$<>"D"THEN740
                                    :rem 36
750 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$
                                    :rem 158
760 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$
    ):POKE782,ZK/256                :rem 3
762 POKE781,ZK-PEEK(782)*256:POKE780,LEN(
    T$):SYS65469                   :rem 109
763 POKE780,1:POKE781,DV:POKE782,1:SYS654
    66                             :rem 69
765 POKE254,S/256:POKE253,S-PEEK(254)*256
    :POKE780,253                    :rem 12
766 POKE782,E/256:POKE781,E-PEEK(782)*256
    :SYS65496                      :rem 124
770 IF(PEEK(783)AND1)OR(ST AND191)THEN780
                                    :rem 111
775 PRINT"{DOWN}DONE.":END         :rem 106
780 PRINT"{DOWN}ERROR ON SAVE.{2 SPACES}T
    RY AGAIN.":IFDV=1THEN720       :rem 171
781 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$
    ;E2$:CLOSE15:GOTO720           :rem 103
782 GOTO720                        :rem 115
790 PRINT"{CLR}{RVS}*** LOAD ***{2 DOWN}"
                                    :rem 212
800 INPUT"{2 DOWN} FILENAME";F$    :rem 244
810 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
    {RVS}D{OFF}ISK: (T/D)"         :rem 227
820 GETA$:IFA$<>"T"ANDA$<>"D"THEN820
                                    :rem 34
830 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$
                                    :rem 157
840 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$
    ):POKE782,ZK/256                :rem 2
841 POKE781,ZK-PEEK(782)*256:POKE780,LEN(
    T$):SYS65469                   :rem 107
845 POKE780,1:POKE781,DV:POKE782,1:SYS654
    66                             :rem 70
850 POKE780,0:SYS65493              :rem 11
860 IF(PEEK(783)AND1)OR(ST AND191)THEN870
                                    :rem 111
865 PRINT"{DOWN}DONE.":GOTO310     :rem 96
870 PRINT"{DOWN}ERROR ON LOAD.{2 SPACES}T
    RY AGAIN.{DOWN}":IFDV=1THEN800
                                    :rem 172
880 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$
    ;E2$:CLOSE15:GOTO800           :rem 102
1000 REM BUZZER                    :rem 135
1001 POKE36878,15:POKE36874,190    :rem 206
1002 FORW=1TO300:NEXTW             :rem 117
1003 POKE36878,0:POKE36874,0:RETURN:rem 74
2000 REM BELL SOUND                 :rem 78
2001 FORW=15TO0STEP-1:POKE36878,W:POKE368
    76,240:NEXTW                    :rem 22
2002 POKE36876,0:RETURN            :rem 119
3000 PRINTC$;"{RVS}NOT ZERO PAGE OR ROM":
    GOTO1000                        :rem 89
```

COMPUTE!'s Guide To Typing In Programs

Before typing in any program, you should familiarize yourself with your computer. Learn how to use the keyboard to type in and correct BASIC programs. Read your manuals to understand how to save and load BASIC programs to and from your disk drive or cassette unit. Computers are precise—take special care to type the program *exactly* as listed, including any necessary punctuation and symbols. To help you with this task, we have implemented a special listing convention as well as a program to help check your typing—the "Automatic Proofreader." Please read the following notes before typing in any programs from COMPUTE!. They can save you a lot of time and trouble.

Since programs can contain some hard-to-read (and hard-to-type) special characters, we have developed a listing system that spells out in abbreviated form the function of these control characters. You will find these special characters within curly braces. For example, {CLEAR} or {CLR} instructs you to insert the symbol which clears the screen on the Atari or Commodore machines. A symbol by itself within curly braces is usually a control key or graphics key. If you see {A}, hold down the CONTROL key and press A. Commodore machines have a special control key labeled with the Commodore logo. Graphics characters entered with the Commodore logo key are enclosed in a new kind of special bracket. A graphics character can be listed as [<A>]. In this case, hold down the Commodore logo key as you type A. Our Commodore listings are in uppercase, so shifted symbols are underlined. A graphics heart symbol (SHIFT-S) would be listed as S. One exception is {SHIFT-SPACE}. Hold down SHIFT and press the space bar.

If a number precedes a symbol, such as {5 RIGHT}, {6 S}, or [<8 Q>], you would enter five cursor rights, six shifted S's, or eight Commodore-Q's. On the Atari, inverse characters (printed in white on black) should be entered with the Atari logo key. Since spacing is sometimes important, any more than two spaces will be listed, for example, as: {6 SPACES}. A space is never left at the end of a line, but will be moved to the next printed line as {SPACE}. There are no special control characters found in our IBM PC/PCjr, TI-99/4A, and Apple program listings. For your convenience, we have prepared this quick-reference key for the Commodore and Atari special characters:

Atari 400/800/XL

When you see	Type	See	
{CLEAR}	ESC SHIFT <		Clear Screen
{UP}	ESC CTRL -	↑	Cursor Up
{DOWN}	ESC CTRL =	↓	Cursor Down
{LEFT}	ESC CTRL +	←	Cursor Left
{RIGHT}	ESC CTRL *	→	Cursor Right
{BACK S}	ESC DELETE		Backspace
{DELETE}	ESC CTRL DELETE		Delete character
{INSERT}	ESC CTRL INSERT		Insert character
{DEL LINE}	ESC SHIFT DELETE		Delete line
{INS LINE}	ESC SHIFT INSERT		Insert line
{TAB}	ESC TAB		TAB key
{CLR TAB}	ESC CTRL TAB		Clear tab
{SET TAB}	ESC SHIFT TAB		Set tab stop
{BELL}	ESC CTRL 2		Ring buzzer
{ESC}	ESC ESC		ESCape key

Commodore PET/CBM/VIC/64

When You Read:	Press:	See:	When You Read:	Press:	See:
{CLR}	SHIFT CLR/HOME		{GRN}	CTRL 6	
{HOME}	CLR/HOME		{BLU}	CTRL 7	
{UP}	SHIFT CRSR ↑		{YEL}	CTRL 8	
{DOWN}	CRSR ↑		{F1}	f1	
{LEFT}	SHIFT CRSR ←		{F2}	f2	
{RIGHT}	CRSR ←		{F3}	f3	
{RVS}	CTRL 9		{F4}	f4	
{OFF}	CTRL 0		{F5}	f5	
{BLK}	CTRL 1		{F6}	f6	
{WHT}	CTRL 2		{F7}	f7	
{RED}	CTRL 3		{F8}	f8	
{CYN}	CTRL 4		←	←	
{PUR}	CTRL 5		↑	SHIFT ↑	

The Automatic Proofreader

Also, we have developed a simple, yet effective program that can help check your typing. Type in the appropriate Proofreader program for your machine, then save it for future use. On the VIC, 64, or Atari, run the Proofreader to activate it, then enter NEW to erase the BASIC loader (the Proofreader will still be active, hidden in memory, as a machine language program). Pressing RUN/STOP–RESTORE or SYSTEM RESET deactivates the Proofreader. You can use SYS 886 to reactivate the VIC/64 Proofreader, or PRINT USR(1536) to reenable the Atari Proofreader. The IBM Proofreader is a BASIC program that lets you enter, edit, list, save, and load programs that you type. It simulates the IBM's BASIC line editor.

Using The Automatic Proofreader

Once the Proofreader is active, try typing in a line. As soon as you press RETURN, either a number (on the Commodore) or a pair of letters

(Atari or IBM) appears. The number or pair of letters is called a *checksum*. Try making a change in the line, and notice how the checksum changes.

All you need to do is compare the value provided by the Proofreader with the checksum printed in the program listing in the magazine. In Commodore listings, the checksum is a number from 0 to 255. It is set off from the rest of the line with *rem*. This prevents a syntax error if the checksum is typed in, but the REM statements and checksums need *not* be typed in. It is just there for your information.

In Atari and IBM listings, the checksum is given to the left of each line number. Just type in the program, a line at a time (without the printed checksum) and compare the checksum generated by the Proofreader to the checksum in the listing. If they match, go on to the next line. If not, check your typing: You've made a mistake. On the Commodore and Atari Proofreader, spaces are not counted as part of the checksum, and no check is made to see that you've typed in the characters in the right order. If characters are transposed, the checksum will still match the listing. Because of the checksum method used, do not use abbreviations, such as ? for PRINT. However, the Proofreader does catch the majority of typing errors most people make. The IBM Proofreader is even pickier; it *will* detect errors in spacing and transposition. Also, be sure you leave Caps Lock on, except when you need to enter lowercase characters.

Special Proofreader Notes For Commodore Cassette Users

The Proofreader resides in the cassette buffer, which is used during tape LOADs and SAVEs. Be sure to press RUN/STOP–RESTORE before you save or load a program, to get the Proofreader out of the way. If you want to use the Proofreader with tape, run the Proofreader, then enter these two lines *exactly* as shown, pressing RETURN after each one:

```
A$="PROOFREADER.T":B$="{10 SPACES}"
    :FORX=1TO4:A$=A$+B$:NEXT

FORX=886TO1018:A$=A$+CHR$(PEEK(X))
    :NEXT:OPEN 1,1,1,A$:CLOSE1
```

Then press RECORD and PLAY on a blank tape, and a special version of the Proofreader will be saved to tape. Anytime you need to reload the Proofreader after it has been erased, just rewind the tape, type OPEN1:CLOSE1, then press PLAY. When READY comes back, enter SYS 886.

IBM Proofreader Commands

Since the IBM Proofreader replaces the computer's normal BASIC line editor, it has to include many of the direct-mode IBM BASIC commands. The syntax is identical to IBM BASIC. Commands simulated are LIST, LLIST, NEW, FILES, SAVE, and LOAD. When listing your program, press any key (except Ctrl-Break) to stop the listing. If you enter NEW, the Proofreader will prompt you to press Y to be especially sure you mean yes.

Two new commands are BASIC and CHECK. BASIC exits the Proofreader back to IBM BASIC, leaving the Proofreader in memory. CHECK works just like LIST, but shows the checksums along with the listing. After you have typed in a program, save it to disk. Then exit the Proofreader with the BASIC command, and load the program into the normal BASIC environment (this will replace the Proofreader in memory). You can now run the program, but you may want to resave it to disk. This will shorten it on disk and make it load faster, but it can no longer be edited with the Proofreader. If you want to convert a program to Proofreader format, save it to disk with SAVE "filename",A.

VIC/64 Proofreader

```
100 PRINT"{CLR}PLEASE WAIT...":FORI=886TO10
    18:READA:CK=CK+A:POKEI,A:NEXT
110 IF CK<>17539 THEN PRINT"{DOWN}YOU MADE
    {SPACE}AN ERROR":PRINT"IN DATA STATEMEN
    TS.":END
120 SYS886:PRINT"{CLR}{2 DOWN}PROOFREADER A
    CTIVATED.":NEW
886 DATA 173,036,003,201,150,208
892 DATA 001,096,141,151,003,173
898 DATA 037,003,141,152,003,169
904 DATA 150,141,036,003,169,003
910 DATA 141,037,003,169,000,133
916 DATA 254,096,032,087,241,133
922 DATA 251,134,252,132,253,008
928 DATA 201,013,240,017,201,032
934 DATA 240,005,024,101,254,133
940 DATA 254,165,251,166,252,164
946 DATA 253,040,096,169,013,032
952 DATA 210,255,165,214,141,251
958 DATA 003,206,251,003,169,000
964 DATA 133,216,169,019,032,210
970 DATA 255,169,018,032,210,255
976 DATA 169,058,032,210,255,166
982 DATA 254,169,000,133,254,172
988 DATA 151,003,192,087,208,006
994 DATA 032,205,189,076,235,003
1000 DATA 032,205,221,169,032,032
1006 DATA 210,255,032,210,255,173
1012 DATA 251,003,133,214,076,173
1018 DATA 003
```

Atari Proofreader

```
100 GRAPHICS 0
110 FOR I=1536 TO 1700:READ A:POKE I
    ,A:CK=CK+A:NEXT I
120 IF CK<>19072 THEN ? "Error in DA
    TA Statements.  Check Typing.":E
    ND
130 A=USR(1536)
140 ? :? "Automatic Proofreader Now
    Activated."
```

```
150 END
1536 DATA 104,160,0,185,26,3
1542 DATA 201,69,240,7,200,200
1548 DATA 192,34,208,243,96,200
1554 DATA 169,74,153,26,3,200
1560 DATA 169,6,153,26,3,162
1566 DATA 0,189,0,228,157,74
1572 DATA 6,232,224,16,208,245
1578 DATA 169,93,141,78,6,169
1584 DATA 6,141,79,6,24,173
1590 DATA 4,228,105,1,141,95
1596 DATA 6,173,5,228,105,0
1602 DATA 141,96,6,169,0,133
1608 DATA 203,96,247,238,125,241
1614 DATA 93,6,244,241,115,241
1620 DATA 124,241,76,205,238,0
1626 DATA 0,0,0,0,32,62
1632 DATA 246,8,201,155,240,13
1638 DATA 201,32,240,7,72,24
1644 DATA 101,203,133,203,104,40
1650 DATA 96,72,152,72,138,72
1656 DATA 160,0,169,128,145,88
1662 DATA 200,192,40,208,249,165
1668 DATA 203,74,74,74,74,24
1674 DATA 105,161,160,3,145,88
1680 DATA 165,203,41,15,24,105
1686 DATA 161,200,145,88,169,0
1692 DATA 133,203,104,170,104,168
1698 DATA 104,40,96
```

IBM Proofreader

```
10 'Automatic Proofreader Version 2.00 (Lines 270,510,515,517,620,630 changed from V1.0)
100 DIM L$(500),LNUM(500):COLOR 0,7,7:KEY OFF:CLS:MAX=0:LNUM(0)=65536!
110 ON ERROR GOTO 120:KEY 15,CHR$(4)+CHR$(70):ON KEY(15) GOSUB 640:KEY (15) ON :GOTO 130
120 RESUME 130
130 DEF SEG=&H40:W=PEEK(&H4A)
140 ON ERROR GOTO 650:PRINT:PRINT"Proofreader Ready."
150 LINE INPUT L$:Y=CSRLIN-INT(LEN(L$)/W)-1:LOCATE Y,1
160 DEF SEG=0:POKE 1050,30:POKE 1052,34:POKE 1054,0:POKE 1055,79:POKE 1056,13:POKE 1057,28:LINE INPUT L$:DEF SEG:IF L$="" THEN 150
170 IF LEFT$(L$,1)=" " THEN L$=MID$(L$,2):GOTO 170
180 IF VAL(LEFT$(L$,2))=0 AND MID$(L$,3,1)=" " THEN L$=MID$(L$,4)
190 LNUM=VAL(L$):TEXT$=MID$(L$,LEN(STR$(LNUM))+1)
200 IF ASC(L$)>57 THEN 260 'no line number, therefore command
210 IF TEXT$="" THEN GOSUB 540:IF LNUM=LNUM(P) THEN GOSUB 560:GOTO 150 ELSE 150
220 CKSUM=0:FOR I=1 TO LEN(L$):CKSUM=(CKSUM+ASC(MID$(L$,I))*I) AND 255:NEXT:LOCATE Y,1:PRINT CHR$(65+CKSUM/16)+CHR$(65+(CKSUM AND 15))+" "+L$
230 GOSUB 540:IF LNUM(P)=LNUM THEN L$(P)=TEXT$:GOTO 150 'replace line
240 GOSUB 580:GOTO 150 'insert the line
260 TEXT$="":FOR I=1 TO LEN(L$):A=ASC(MID$(L$,I)):TEXT$=TEXT$+CHR$(A+32*(A>96 AND A<123)):NEXT
270 DELIMITER=INSTR(TEXT$," "):COMMAND$=TEXT$:ARG$="":IF DELIMITER THEN COMMAND$=LEFT$(TEXT$,DELIMITER-1):ARG$=MID$(TEXT$,DELIMITER+1) ELSE DELIMITER=INSTR(TEXT$,CHR$(34)):IF DELIMITER THEN COMMAND$=LEFT$(TEXT$,DELIMITER-1):ARG$=MID$(TEXT$,DELIMITER)
280 IF COMMAND$<>"LIST" THEN 410
290 OPEN "scrn:" FOR OUTPUT AS #1
300 IF ARG$="" THEN FIRST=0:P=MAX-1:GOTO 340
310 DELIMITER=INSTR(ARG$,"-"):IF DELIMITER=0 THEN LNUM=VAL(ARG$):GOSUB 540:FIRST=P:GOTO 340
320 FIRST=VAL(LEFT$(ARG$,DELIMITER)):LAST=VAL(MID$(ARG$,DELIMITER+1))
330 LNUM=FIRST:GOSUB 540:FIRST=P:LNUM=LAST:GOSUB 540:IF P=0 THEN P=MAX-1
340 FOR X=FIRST TO P:N$=MID$(STR$(LNUM(X)),2)+" "
350 IF CKFLAG=0 THEN A$="":GOTO 370
360 CKSUM=0:A$=N$+L$(X):FOR I=1 TO LEN(A$):CKSUM=(CKSUM+ASC(MID$(A$,I))*I) AND 255:NEXT:A$=CHR$(65+CKSUM/16)+CHR$(65+(CKSUM AND 15))+" "
370 PRINT #1,A$+N$+L$(X)
380 IF INKEY$<>"" THEN X=P
390 NEXT :CLOSE #1:CKFLAG=0
400 GOTO 130
410 IF COMMAND$="LLIST" THEN OPEN "lpt1:" FOR OUTPUT AS #1:GOTO 300
420 IF COMMAND$="CHECK" THEN CKFLAG=1:GOTO 290
430 IF COMMAND$<>"SAVE" THEN 450
440 GOSUB 600:OPEN ARG$ FOR OUTPUT AS #1:ARG$="":GOTO 300
450 IF COMMAND$<>"LOAD" THEN 490
460 GOSUB 600:OPEN ARG$ FOR INPUT AS #1:MAX=0:P=0
470 WHILE NOT EOF(1):LINE INPUT #1,L$:LNUM(P)=VAL(L$):L$(P)=MID$(L$,LEN(STR$(VAL(L$)))+1):P=P+1:WEND
480 MAX=P:CLOSE #1:GOTO 130
490 IF COMMAND$="NEW" THEN INPUT "Erase program - Are you sure";L$:IF LEFT$(L$,1)="y" OR LEFT$(L$,1)="Y" THEN MAX=0:GOTO 130:ELSE 130
500 IF COMMAND$="BASIC" THEN COLOR 7,0,0:ON ERROR GOTO 0:CLS:END
510 IF COMMAND$<>"FILES" THEN 520
515 IF ARG$="" THEN ARG$="A:" ELSE SEL=1:GOSUB 600
517 FILES ARG$:GOTO 130
520 PRINT"Syntax error":GOTO 130
540 P=0:WHILE LNUM>LNUM(P) AND P<MAX:P=P+1:WEND:RETURN
560 MAX=MAX-1:FOR X=P TO MAX:LNUM(X)=LNUM(X+1):L$(X)=L$(X+1):NEXT:RETURN
580 MAX=MAX+1:FOR X=MAX TO P+1 STEP -1:LNUM(X)=LNUM(X-1):L$(X)=L$(X-1):NEXT:L$(P)=TEXT$:LNUM(P)=LNUM:RETURN
600 IF LEFT$(ARG$,1)<>CHR$(34) THEN 520 ELSE ARG$=MID$(ARG$,2)
610 IF RIGHT$(ARG$,1)=CHR$(34) THEN ARG$=LEFT$(ARG$,LEN(ARG$)-1)
620 IF SEL=0 AND INSTR(ARG$,".")=0 THEN ARG$=ARG$+".BAS"
630 SEL=0:RETURN
640 CLOSE #1:CKFLAG=0:PRINT"Stopped.":RETURN 150
650 PRINT "Error #";ERR:RESUME 150
```

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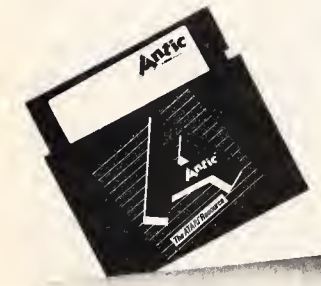

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04	40	19	02	33	12	44	04	28

BREAD						TO		
RR1	EH	EH	PA1	DD1	PAS	TT2	UW2	
14	07	07	00	21	04	13	31	

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